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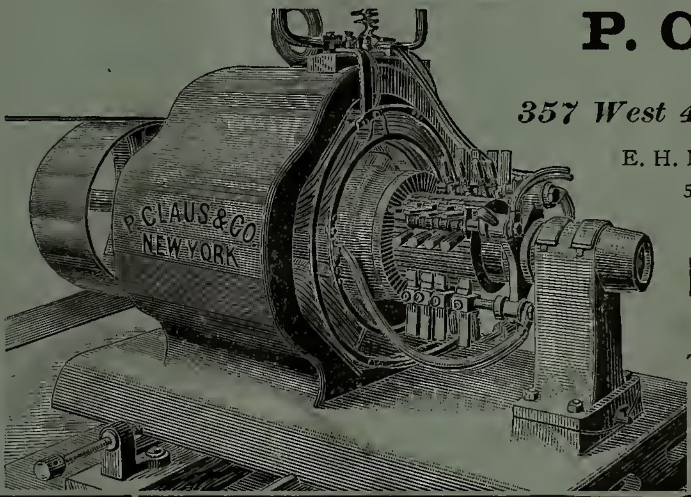

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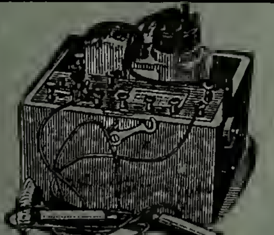

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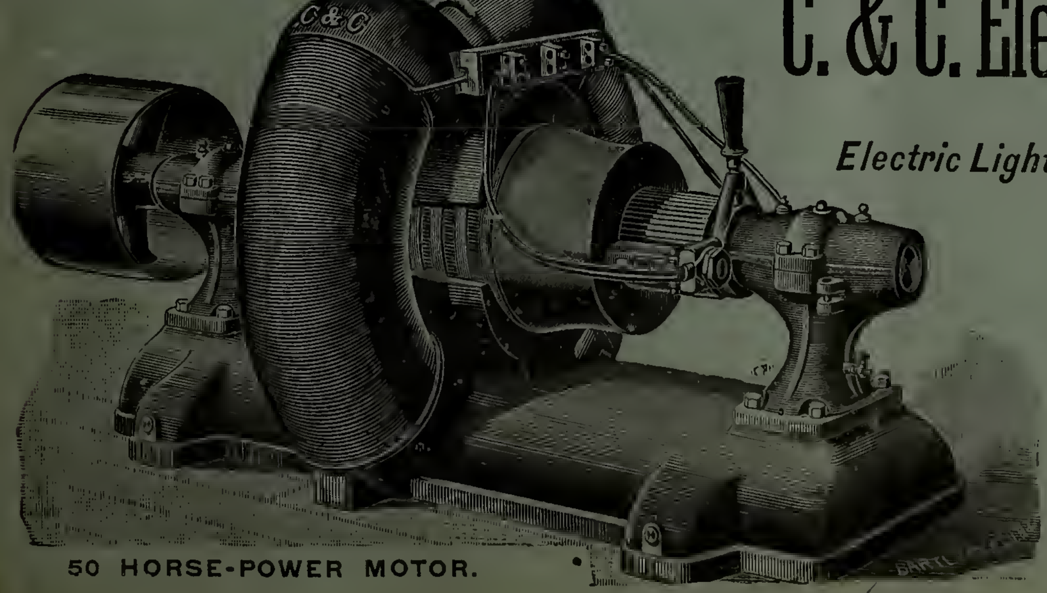

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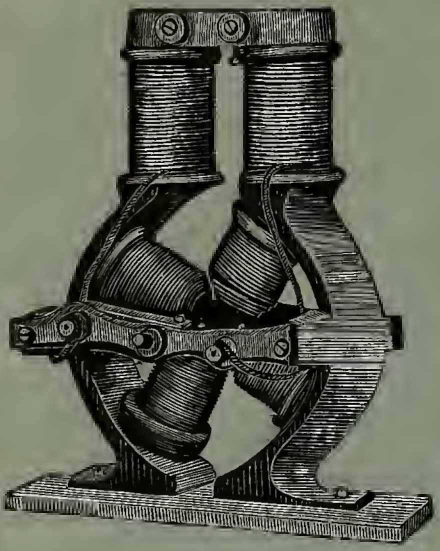

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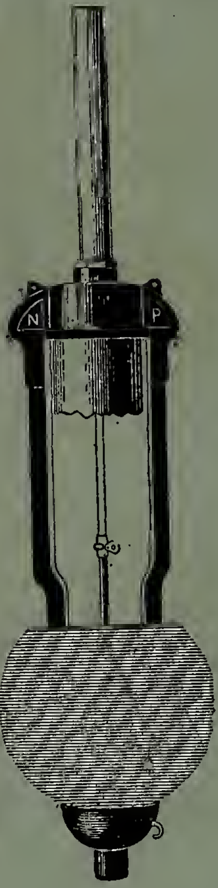

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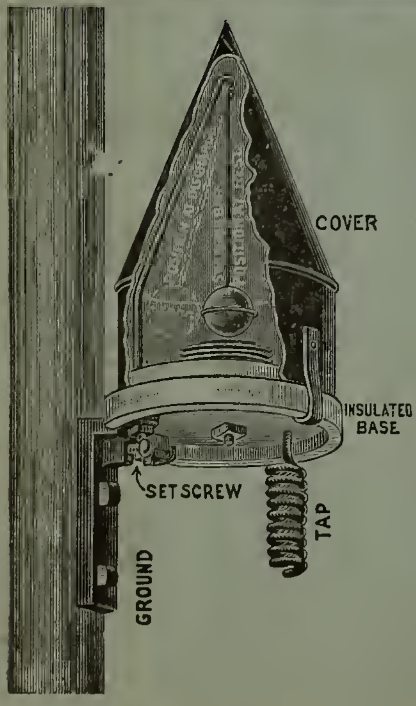

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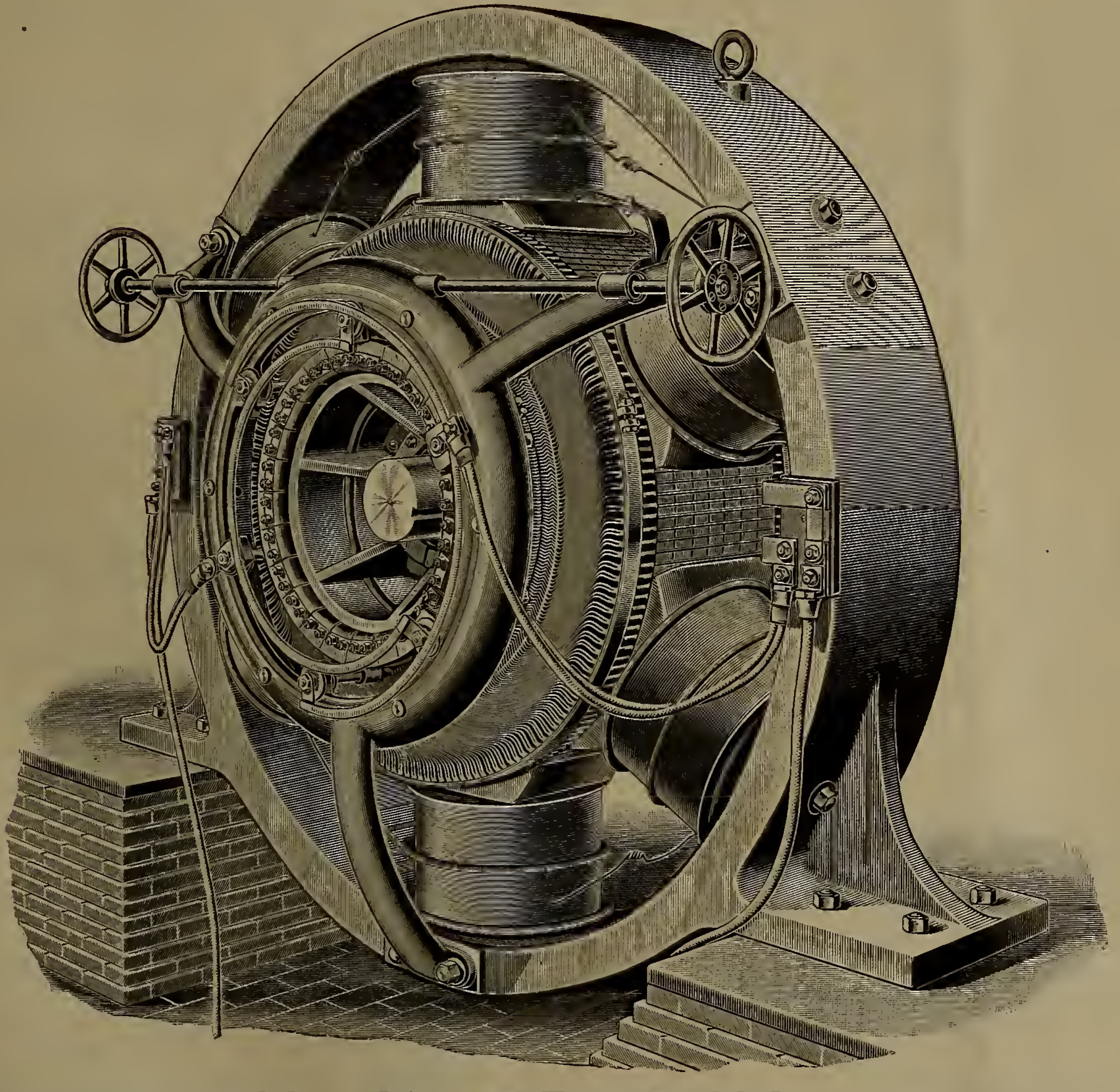

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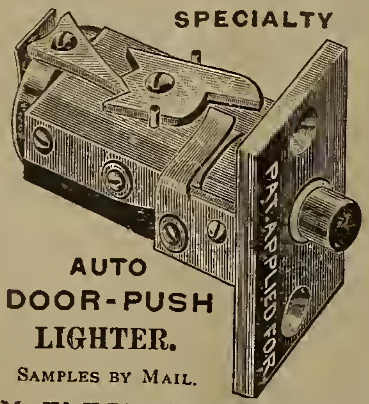

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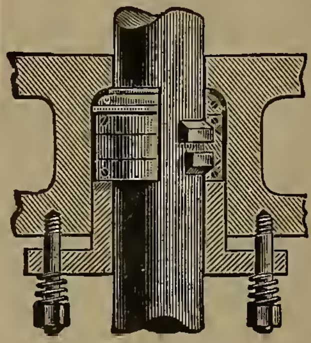

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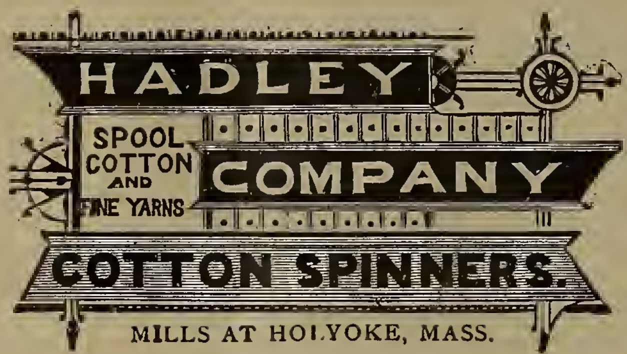

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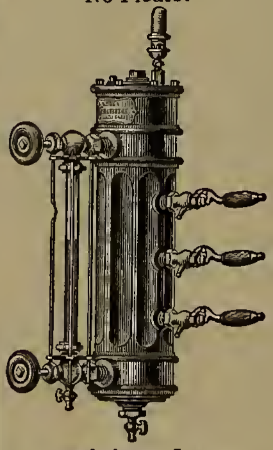

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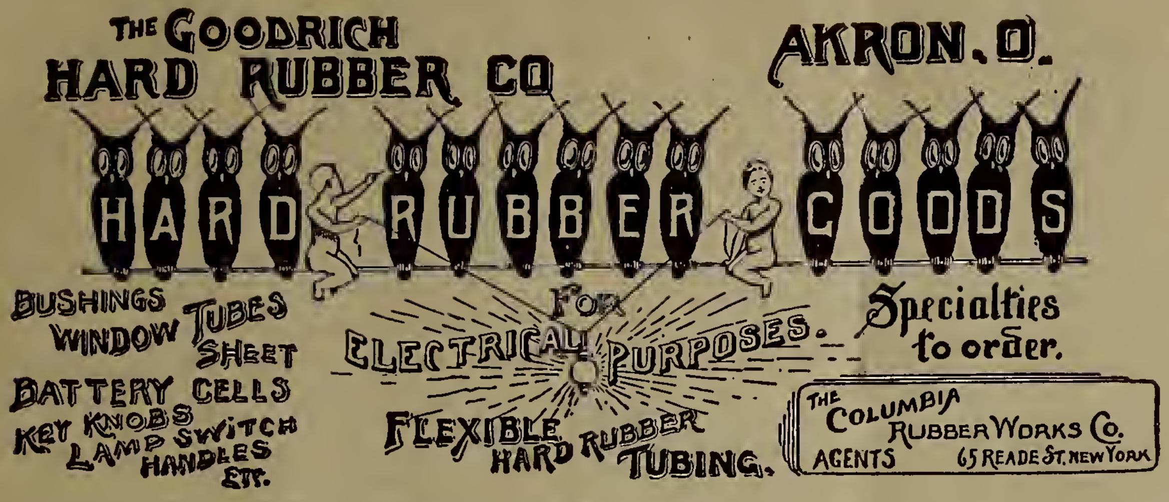

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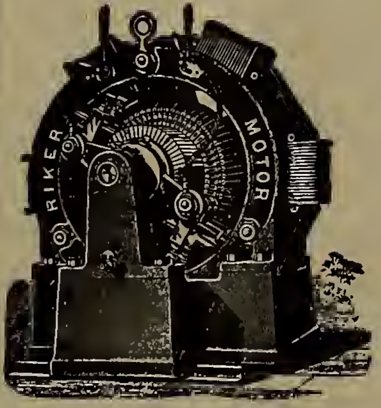

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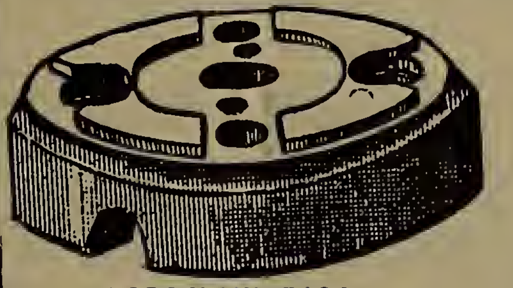

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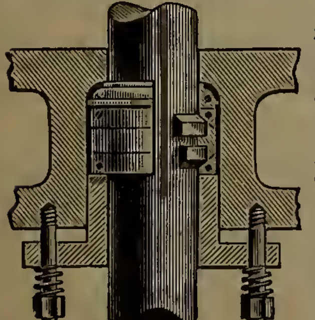

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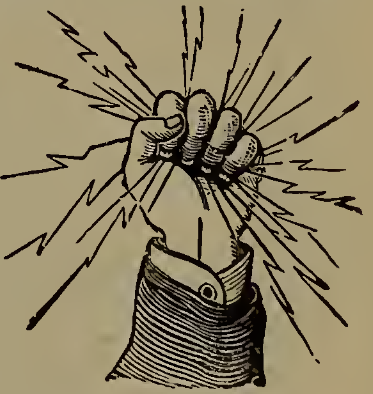

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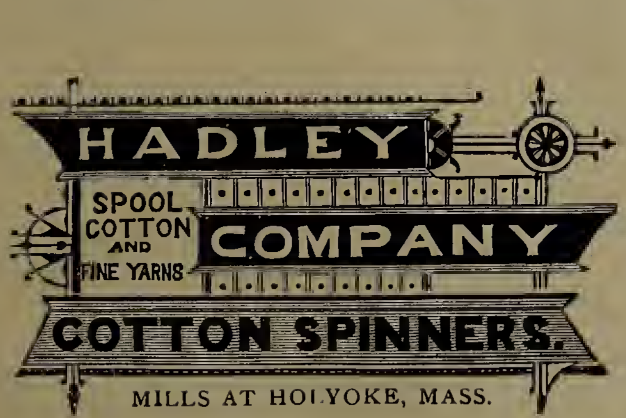

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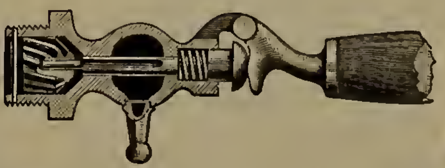

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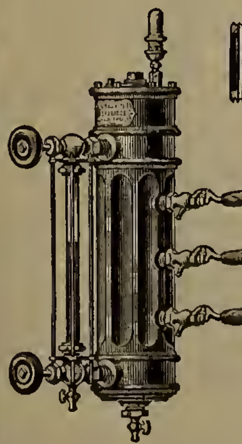

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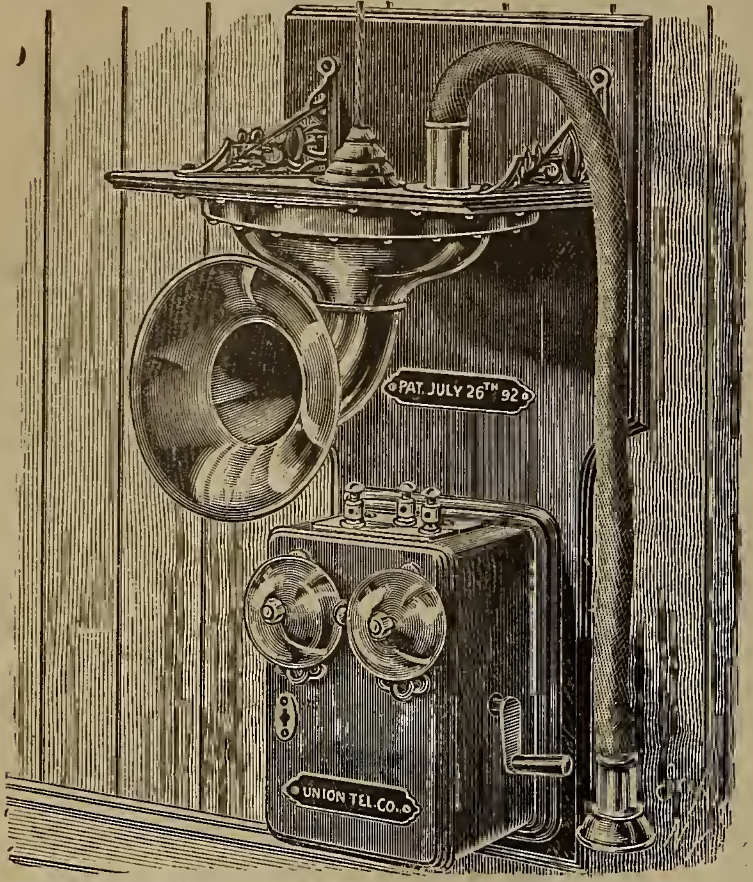

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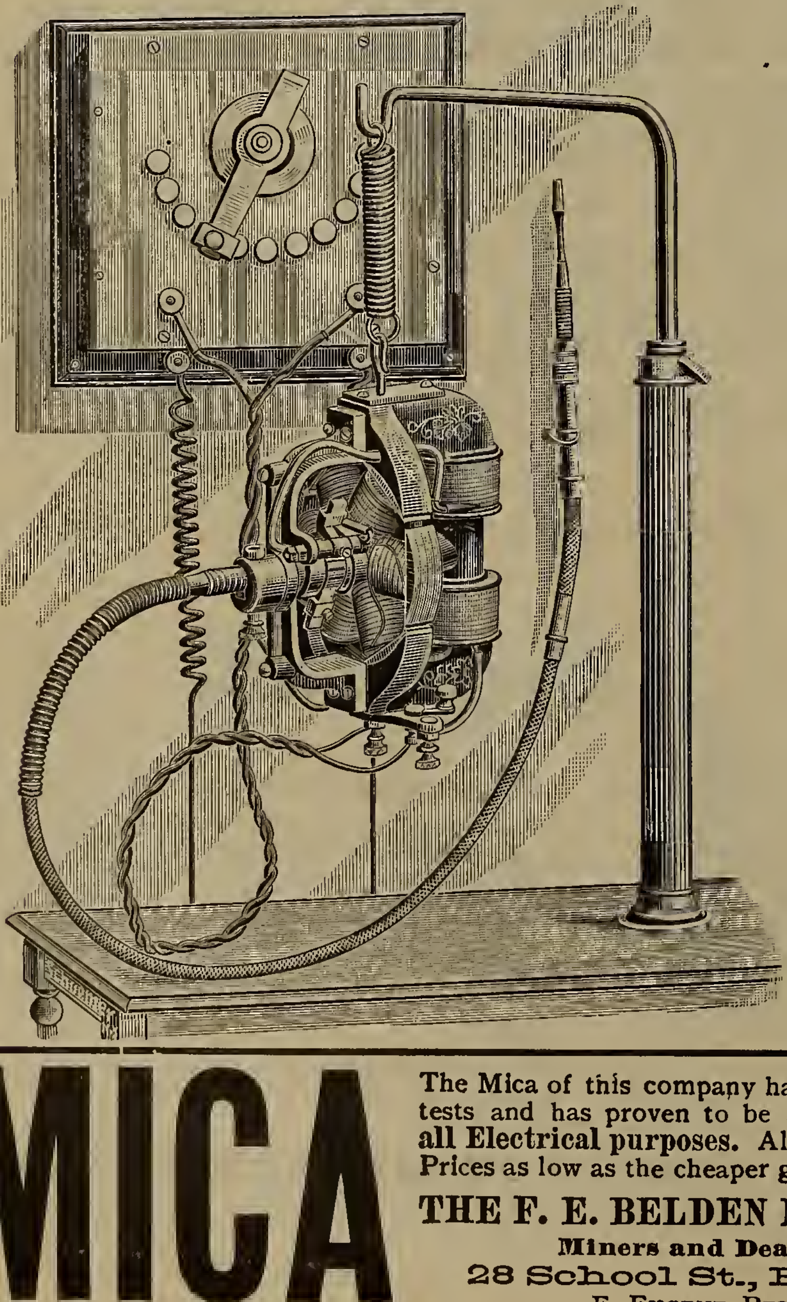

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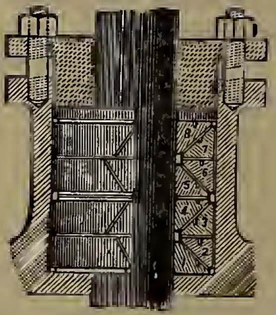

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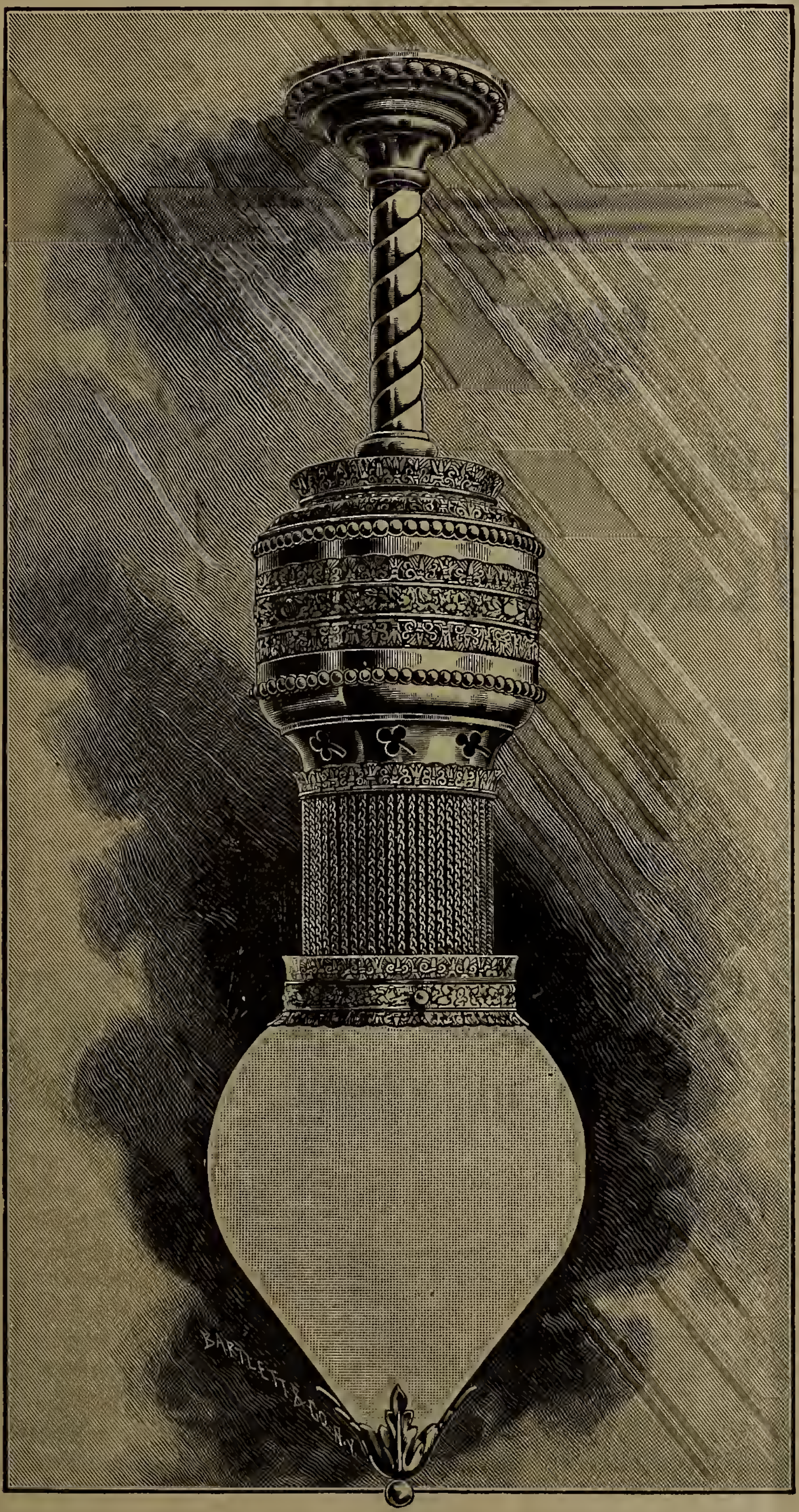

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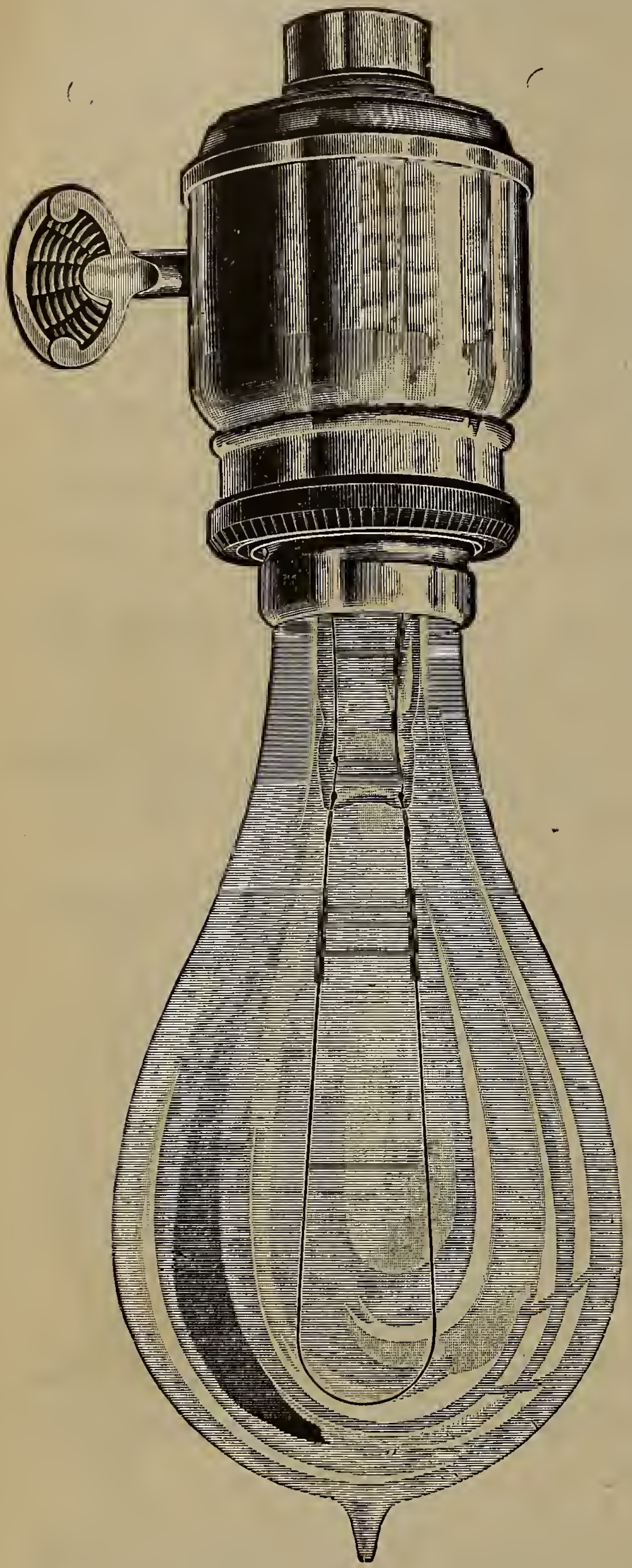

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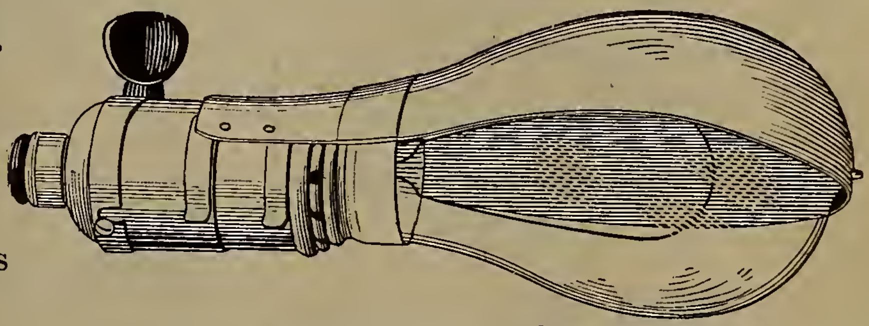

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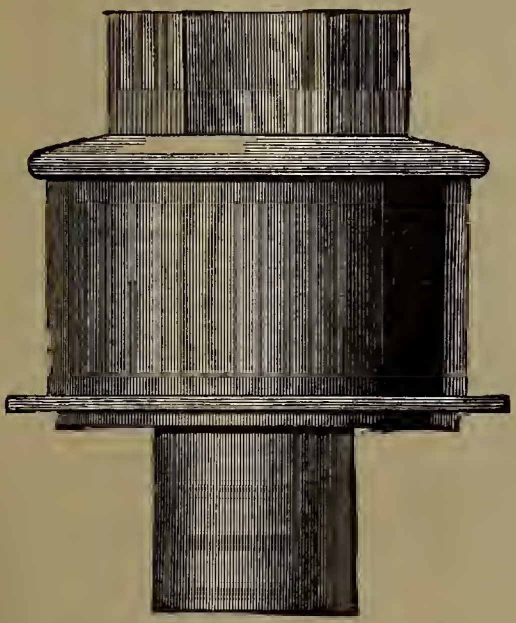

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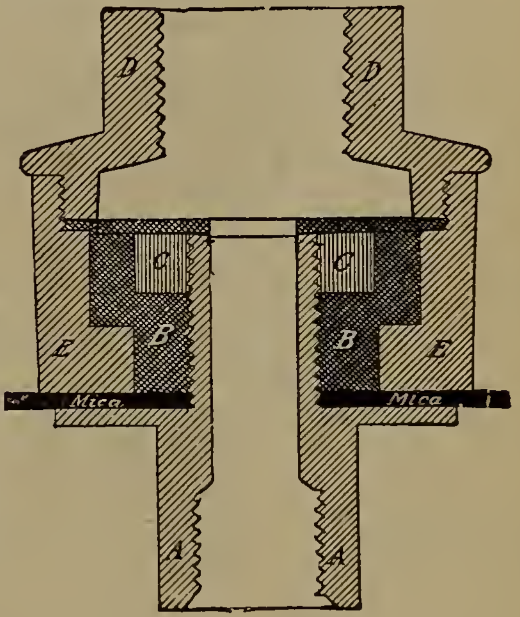

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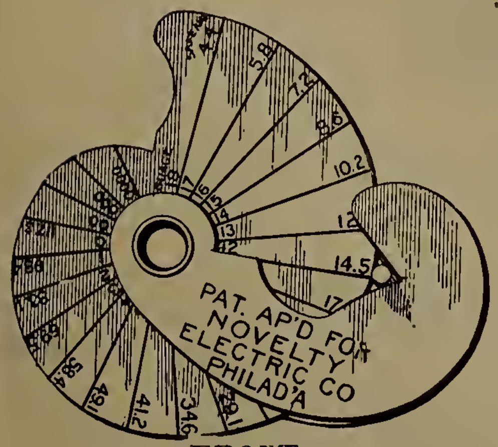

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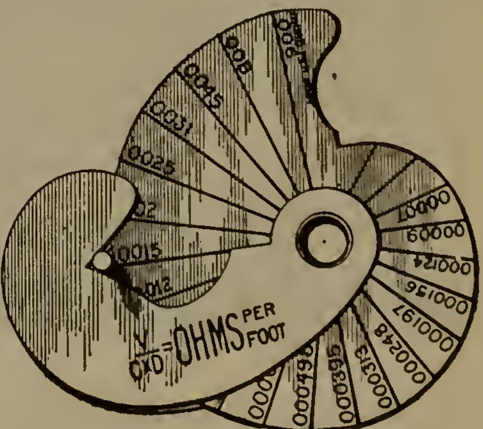

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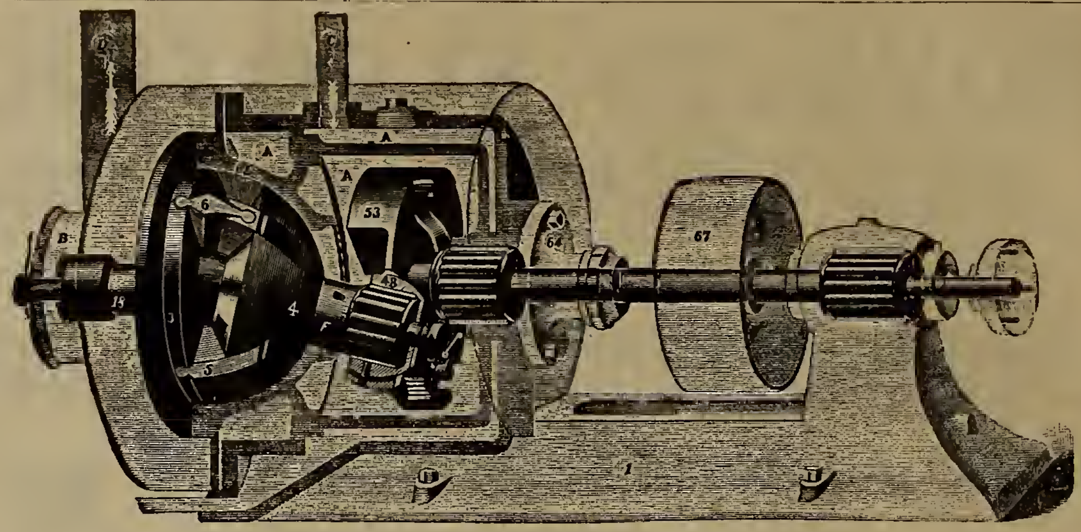

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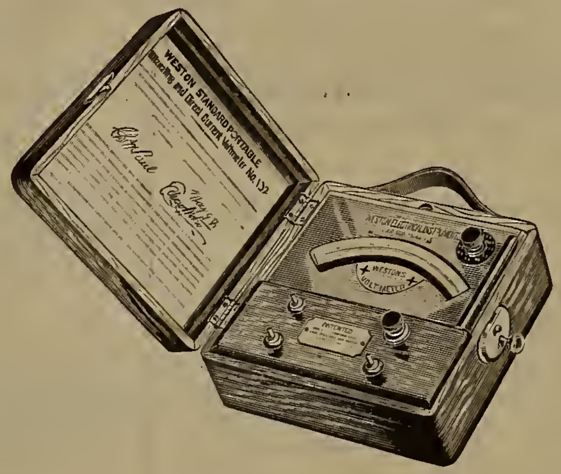

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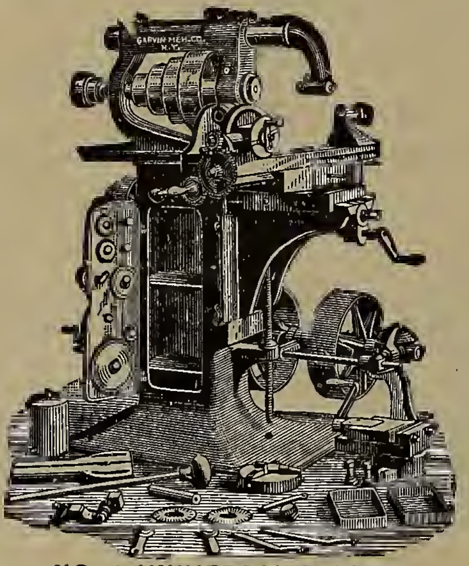
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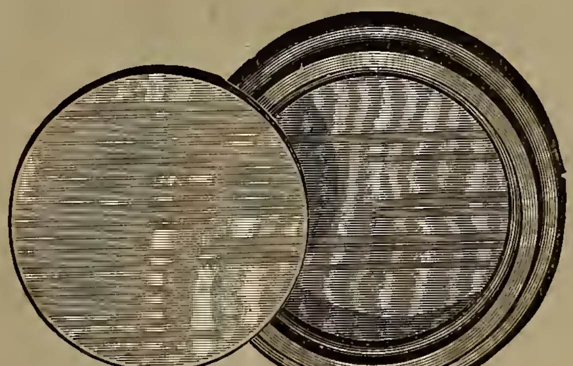

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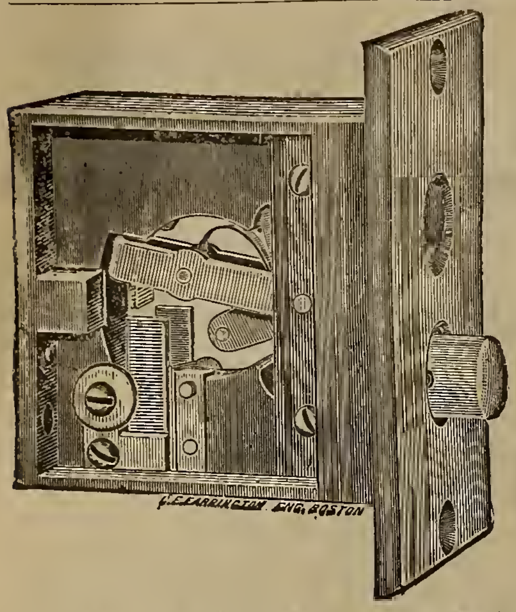

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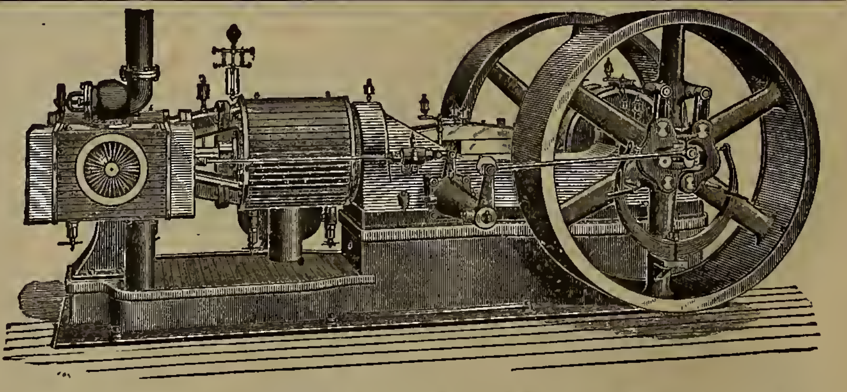

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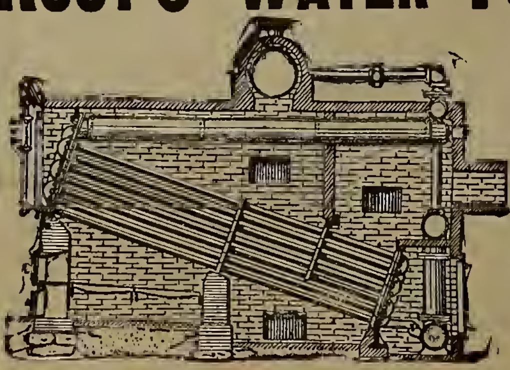

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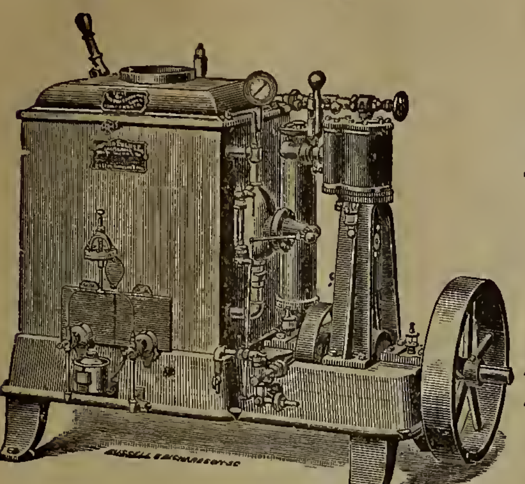

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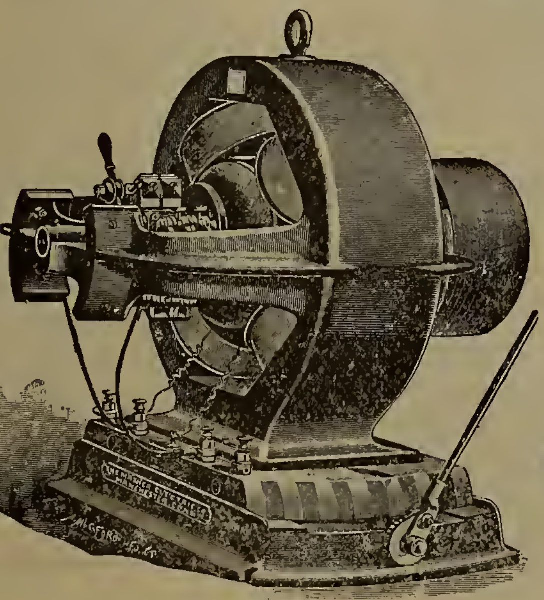

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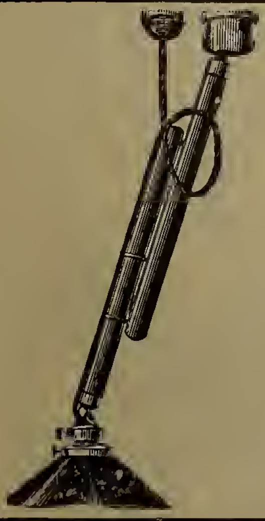

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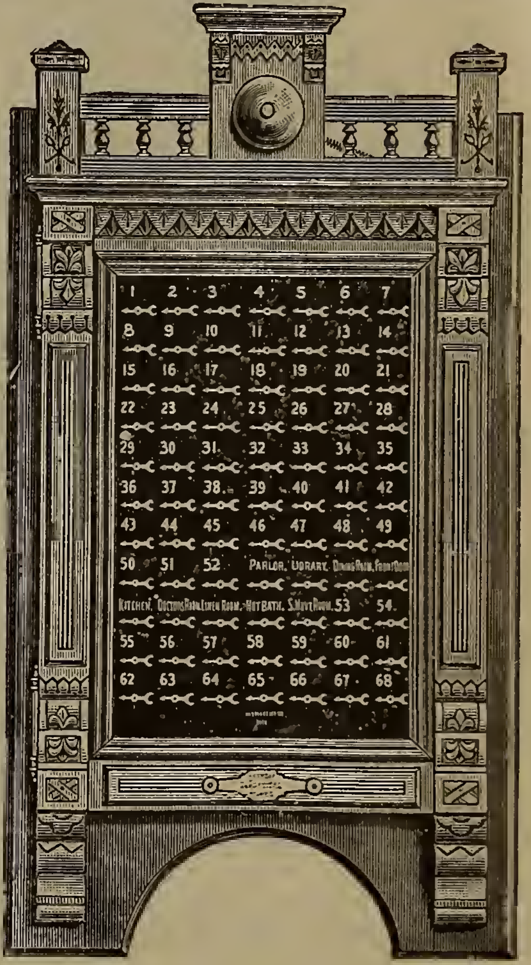

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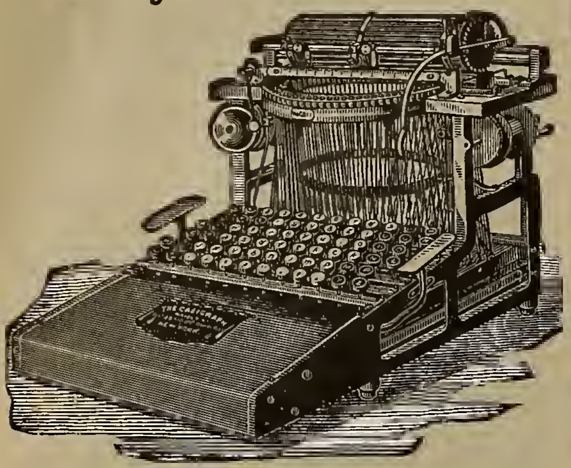

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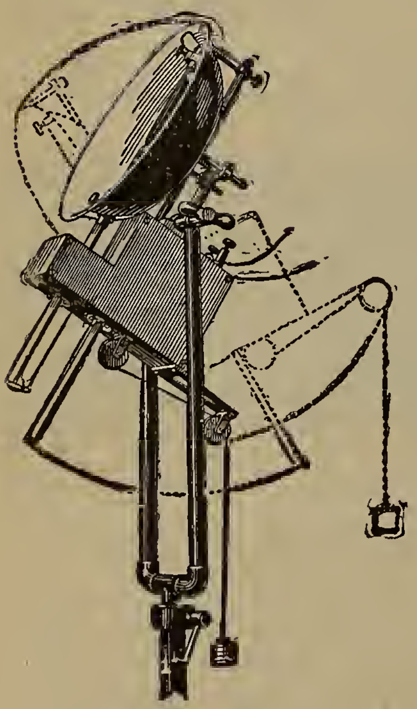

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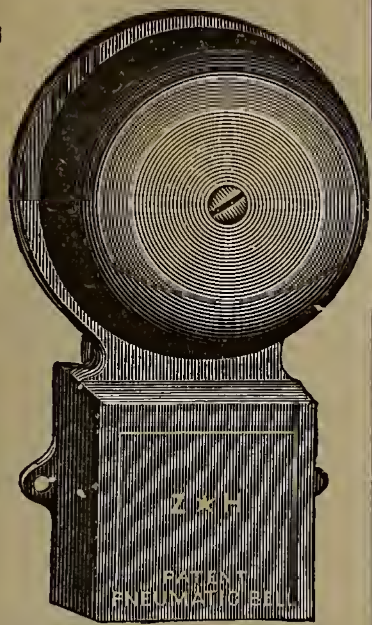

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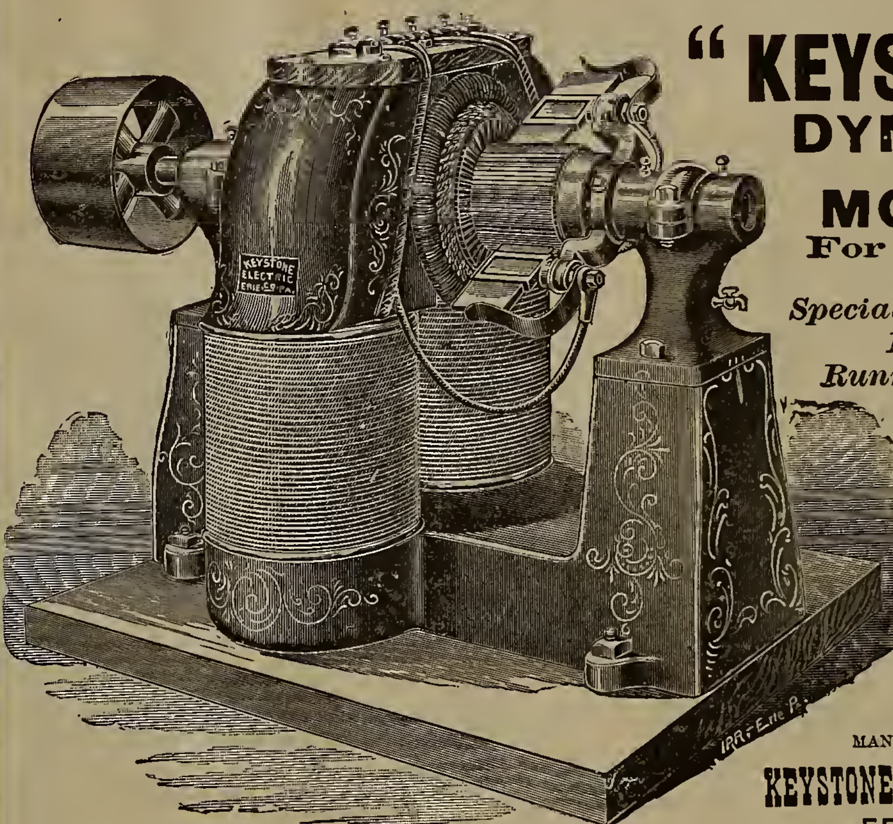

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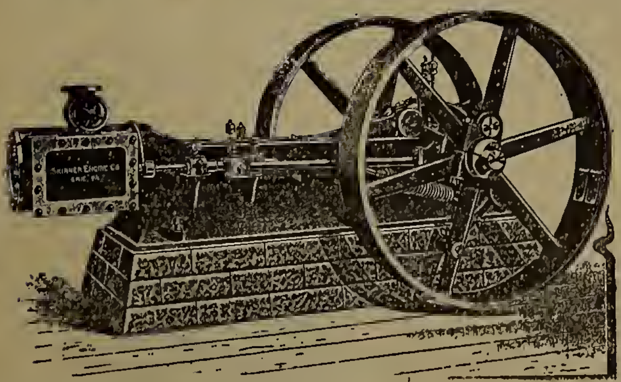

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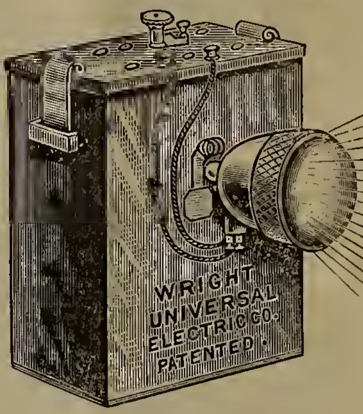

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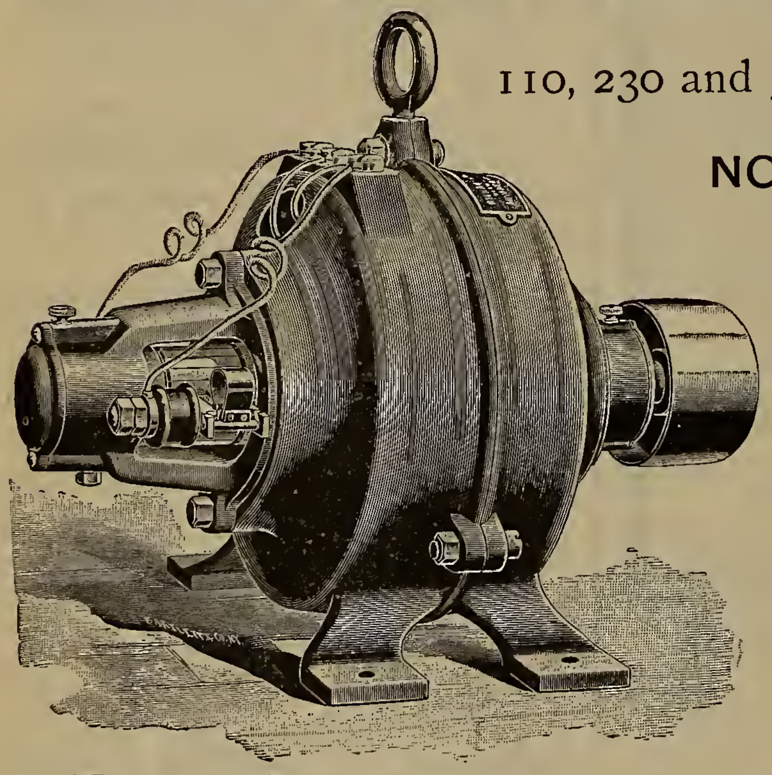

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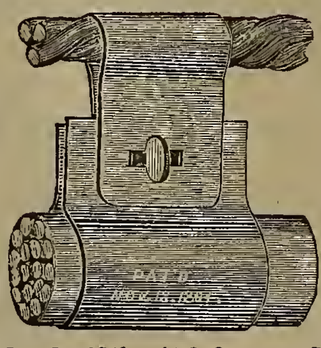

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THE RECORD OF 1892.

On another page we give a record of important events relating to electrical progress which occurred during the past year. It will be found very convenient and valuable for reference. A record of deaths among notable electrical people during the same period is also given.

ELECTRICITY IN MINING OPERATIONS.

The availability of electric power for mining operations has frequently been referred to in these columns, and from all reports mine operators are fast learning to appreciate the advantages afforded by electrical apparatus designed for this work. We publish elsewhere in this issue a description and illustrations of an electric mine-pump which possesses some valuable features, not the least of which is its easy portability.

This particular application of electric power, which we are informed is the first instance of the kind in that section, opens up another wide field of usefulness and scores another triumph for electricity.

QUITE AN IDEA.

Senator Mitchell, of Oregon, introduced in the United States Senate, by request, a few days ago, a bill to prohibit electro-magnetization, mesmerizing and hypnotizing human beings. In brief it provides that any person who, anywhere within the jurisdiction of the United States, shall apply a current of electricity upon a person for the purpose of affecting another, or which does so affect, shall be guilty of a crime, punishable by death. The bill also provides a heavy penalty in case a person "having knowledge of such current having been applied" fails to notify the proper authorities of the fact.

ELECTRICALLY PROPELLED CANAL-BOATS.

Canal-boat owners held a meeting in New York city on January 4, and among the proceedings was the passage of a resolution endorsing Governor Flower's recommendation that electricity be used as a motive-power upon the canals in New York State. Now that the boat-owners themselves favor the idea the way is clear for its practical application.

THE PRIMARY BATTERY PROBLEM.

The primary battery *ignis fatuus* is referred to from a common-sense point of view in an article by Mr. G. Emil Hesse, which will be found on another page of this issue. Mr. Hesse points to the absurdity of the statements made by many primary-battery inventors that their particular battery can be maintained for practically nothing. Zinc in a battery corresponds with coal under a boiler; as a certain amount of coal must be consumed to produce a definite amount of power, so must a definite amount of zinc be consumed in a battery to produce a given current. It is impossible to get something from nothing, as some primary-battery advocates would have us believe, when they claim that a certain battery costs practically nothing to maintain. We know that to get an electric current of one horse-power a definite and unalterable amount of zinc must necessarily be consumed, and there is no getting away from the fact. Mr. Hesse gives figures showing the quantity of zinc oxidized per horse-power, and the best batteries made can do no better, or never will. There are batteries, however, which consume zinc without giving an equivalent return in current, and the smaller the difference between the theoretical energy of the zinc and the actual available current the better the battery. There is room for improvement in this direction, but as to getting an electric current from a battery without consuming zinc, that is impossible. Mr. Hesse's article contains other suggestions that are worth the careful consideration of those interested in primary batteries.

SOME ELECTRICAL NOVELTIES.

In the accompanying illustrations will be seen a few new improvements in incandescent lamp clamps, reflectors and holders brought out by the Novelty Electric Company, at 50–54 North Fourth street, Philadelphia. This company, as is well known, handles only a high grade of goods and stands well with the trade.

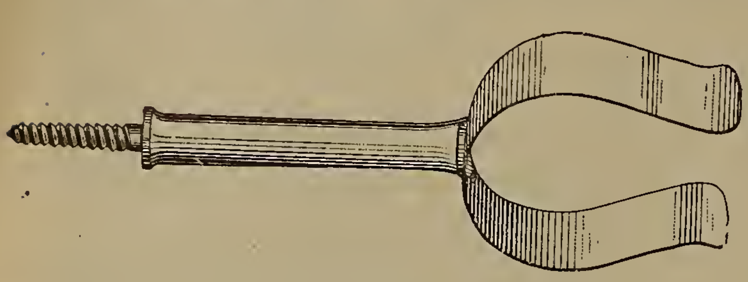


FIG. 1.

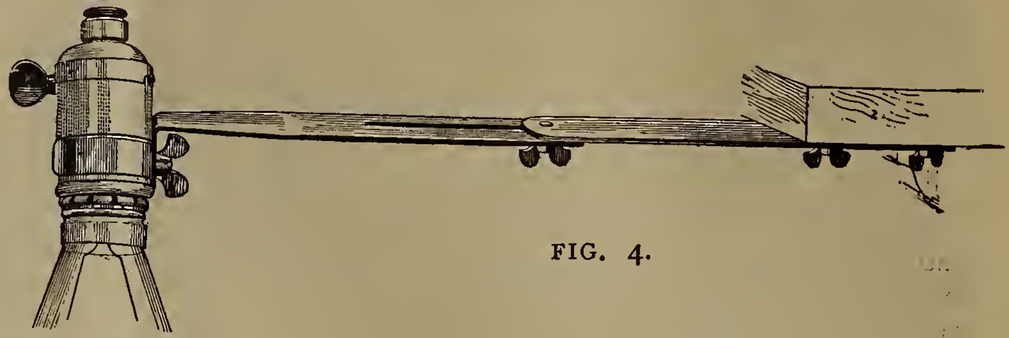


FIG. 4.

Fig. 1 is a straight brass screw-clamp, with a gimlet screw. It is easily fastened at any place on the wall or desk, where it is desired to hold an incandescent lamp. Fig. 2 represents a straight brass shelf-clamp. It screws securely to shelf and is provided with a pivot spring-clamp to receive lamp by which it can be turned at any angle. Fig. 3, the brass shelf-spring clamp is the same as Fig. 2, with the exception that the screw-shelf fastening is at a right angle. Fig. 4, the extension brass shelf-clamp is likewise the same as Fig. 2, with the exception of the arrangement for extension and swing. Fig. 5 shows the movable straight brass spring shelf-clamp which may be fastened temporarily on any desk or shelf, and removed at pleasure. Fig. 5 is a half reflector and shade of the company's own design and manufacture. The reflectors are of simple construction, easily applied, and can be used with any form of shades. Of the latter, the company manufactures a number of different styles. Figs. 6 and 7 are a fan-motor and power-motor respectively, both of which the company makes in various sizes.

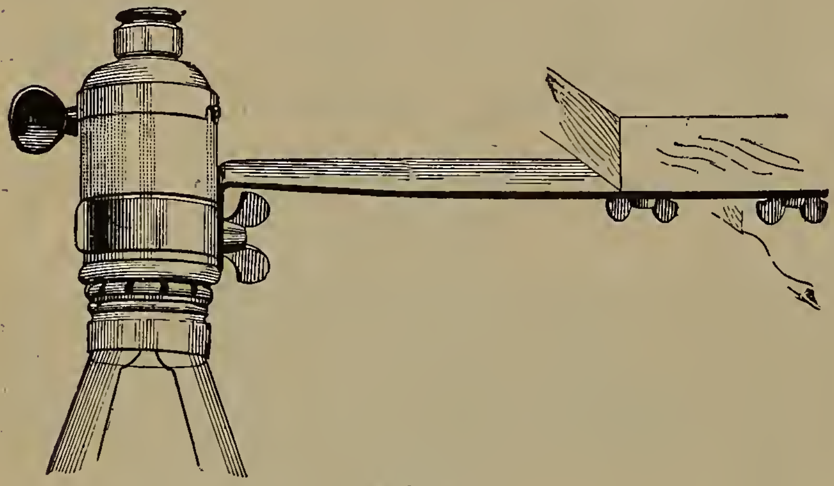


FIG. 2.

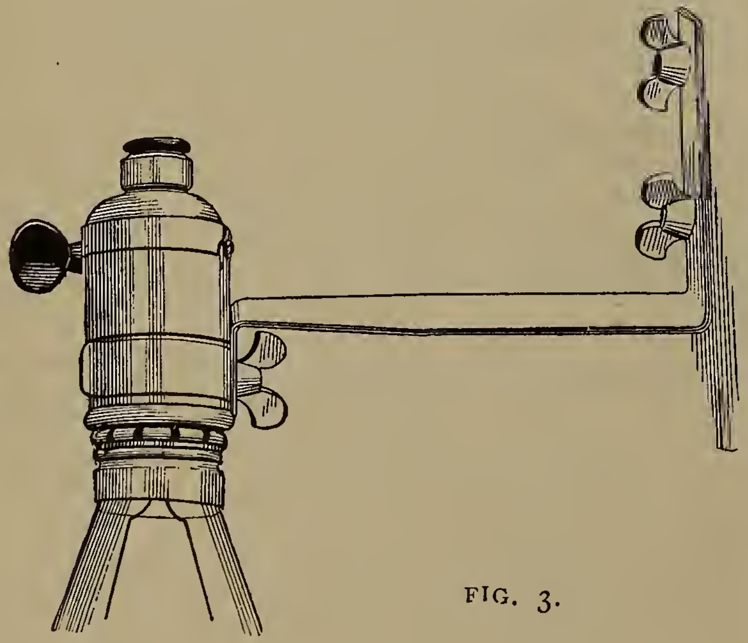


FIG. 3.

A LONG-DISTANCE FIRE.

A fire occurred in Greene, Chenago Co., N. Y., on Christmas morning under alleged peculiar circumstances. A telephone wire ran into the building in which the fire started, and it is claimed that it was crossed with an electric-light wire in Binghamton, 30 miles away, and that the heavy current was conducted over the telephone wire and started the fire. The same current is said to have burned out telephones, etc., at other points along the line.

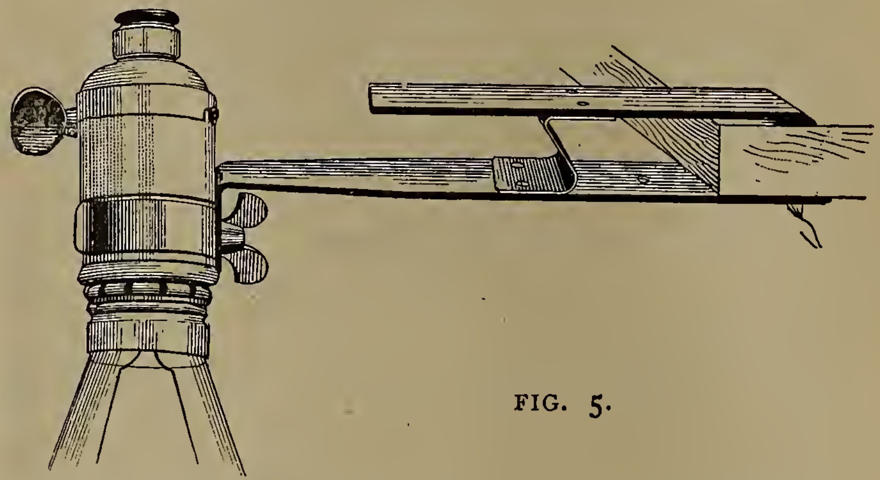
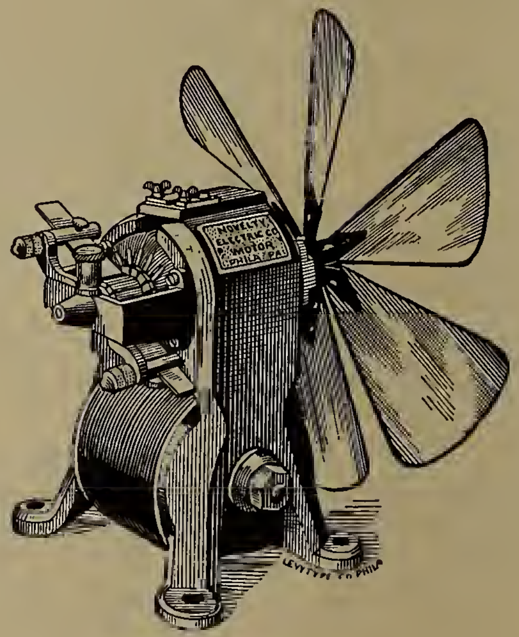


FIG. 5.


NOVELTY ELECTRIC CO. MOTOR PHILA. PA.
FIG. 7.

The new electric-light plant, Chicopee, Mass., will be completed about March 1.

ELECTRIC CRANES.

AN article concerning some of the defects of electric travelling bridge cranes appeared in a recent issue of the *Engineering News*. In referring to the disadvantages of bridge cranes in general, it states that they can be used for only one thing at a time, and the larger the shop the more time is wasted in travel of the bridge. Other objections to it are pointed out. Regarding the extensive use of travelling cranes, the article says :

" Probably the travelling bridge crane owes a considerable part of its popularity to the use of the electric motor to operate it. At any rate a great increase in the popularity of bridge cranes has occurred since electricity was applied to their operation. The advantages of the electric motor for this purpose over a steam motor with its accompanying noise, dirt and clouds of vapor is beyond question. But notwithstanding the great popularity of the electric motor it is not wholly certain that it is the best possible device for operating bridge cranes of every class. Cranes driven by square shafts, by running ropes and by hydraulic power are in use and give good satisfaction, and in some points are claimed to be superior to the electric system.

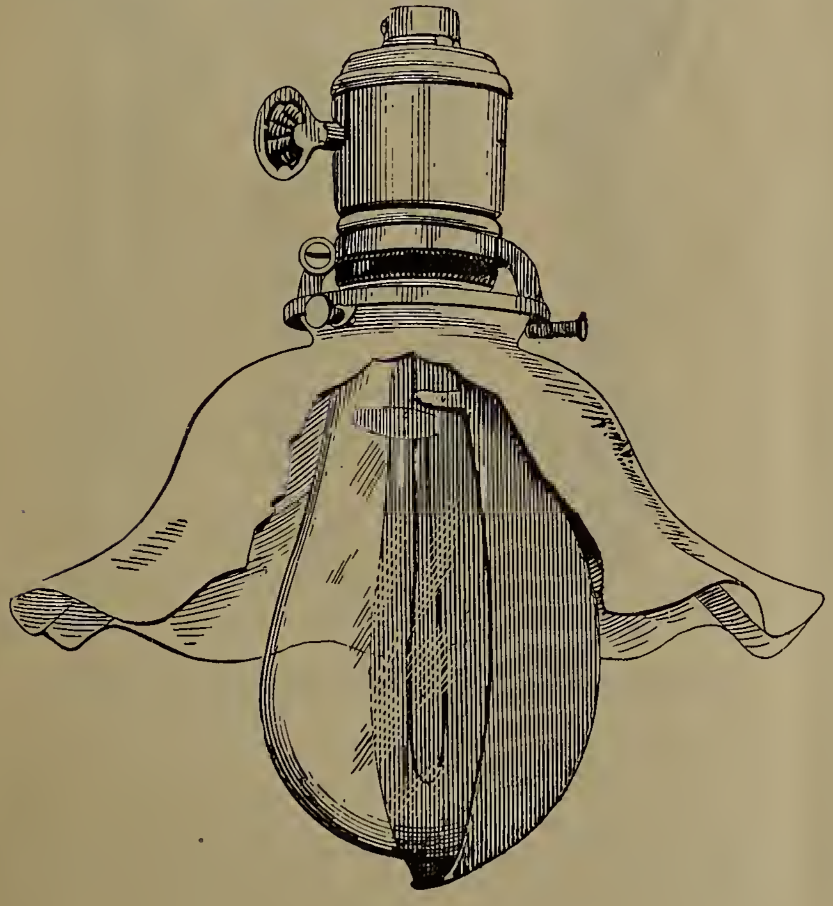


FIG. 6.

" Just what the relative merits of these several classes of cranes are is a subject worth investigation, and one on which little information is to be found in technical literature. At the recent meeting of the American Society of Mechanical Engineers a paper was presented describing recent tests on the electric bridge crane of 120 tons capacity at the Watervliet Arsenal. The author had made exhaustive tests which showed that the mechanical work performed by the crane represented from 20 % to 60 % of the electrical energy absorbed by its motor.

" This information is all very well in its way; but what is wanted in order to compare the relative cost of the power used by electric and other cranes is the actual amount of steam used in the engine which drives the dynamo furnishing current to the crane. The works are very few where an electric crane can take its current from the mains of an electric-lighting company, and we believe the great bulk of electric cranes now in use are operated by an independent circuit, current in which is maintained by a dynamo driven by a separate engine. This circuit must be maintained at all times during working hours, ready for the use of the crane motor, for there is no storage of the electric energy. A bridge crane is a tool which is used only as it is needed, and during all the time it is at rest the dynamo engine goes on using at least enough steam to keep it up to speed.

" Of course where the electric current from the same circuit is also used for driving motors, perhaps on other cranes in the same establishment, the waste of power is not so great, though it will still be considerable ; but at present these conditions obtain in few works. The typical plant consists of engine, dynamo and motor or motors on the crane as stated. In short, then, the electric crane tends to use power wastefully on account of its lack of storage.

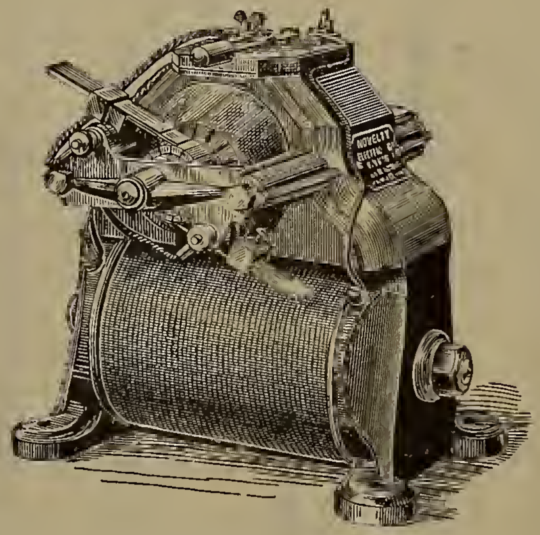


FIG. 8.

" Whether the ability to store power which a hydraulic plant possesses can make its total economy greater than that of the electric motor system is something which only careful tests can determine. Nor will any one maintain that the power used by a crane is an important matter compared with convenience, safety and rapidity of movement. So far as it is important, however, the defects as well as the advantages of each system should have fair consideration.

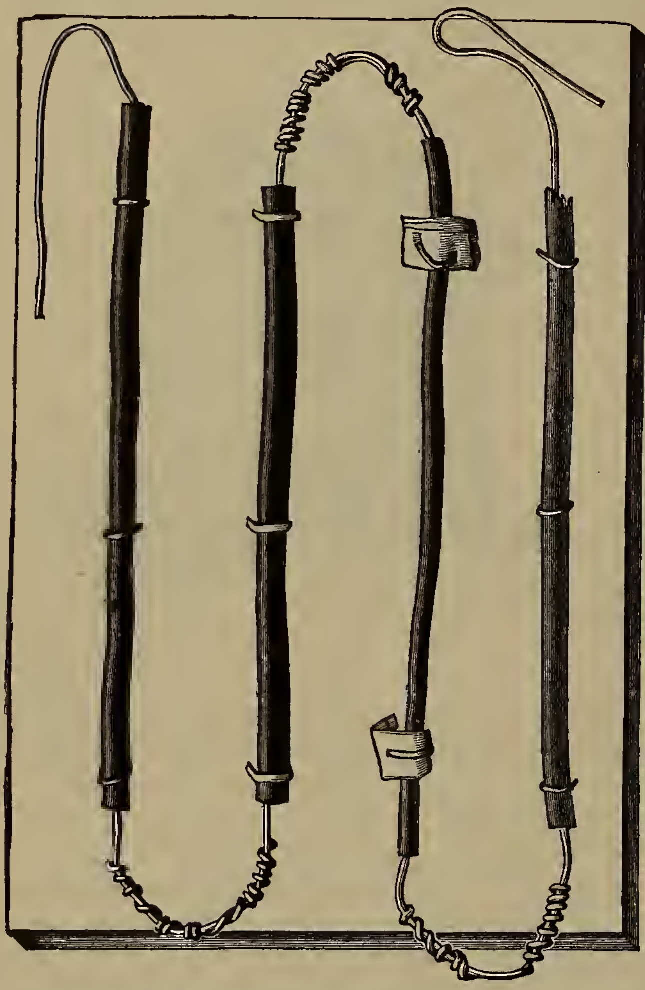
" The question of first cost in many plants will be considered of more importance than the cost of motive-power ; and here the running-rope or square-shaft system, especially the former, deserves to be carefully compared with the electric system. The running-rope system is simple, cheap and economical of power, and deserves to be more used for cranes of moderate capacity. The square-shaft system is in use on cranes of considerable capacity, but is objected to by some on the score of noise and rapid wear. Considering that the electric system has to be debited with the cost of a steam-engine and dynamo capable of furnishing a current up to the crane's capacity, the chances seem very good that either the square-shaft or the rope system could show a considerably smaller first cost. With the hydraulic system the balance is more doubtful.

" Of course there are many other considerations, such as reliability, cost of repairs, attendance required, speed obtainable, etc., which must enter into any thorough comparison of the relative merits of different motive-powers for bridge cranes. The trouble is that at present such problems as this are given slight attention. It is too often considered that an electric bridge crane must be the best possible solution of the problem, since its use is now so general, whereas more careful study might lead to a different solution of the problem.

"SALAMANDER WIRE."

When the necessity for a thing is created the thing needed is always sure to be produced. Thus, when it became evident that electric wire with a fire-proof insulation was an absolute necessity, inventors at once set to work to get up such an insulation. The success of these efforts has varied considerably, and while many insulations are represented to be fire-proof they do not always prove to be so when the actual fire test is applied.

The Washburn & Moen Manufacturing Co., of Worcester, Mass., has, however, recently produced a grade of insulation that justly entitles it to the name which has been given it, namely, "Salamander." The most extreme fire tests to which it has been subjected have failed to produce any visible effect upon it, and it stands to-day unrivalled in its fire-resisting qualities.



SALAMANDER WIRE—BEFORE THE TEST.

On the 18th of August, 1892, a test of "Salamander" wire was made in New York city before a body of insurance electrical inspectors and experts to demonstrate the fire-proof qualities of the insulation. The results were remarkable. The tests were conducted in the following manner: Several smooth sample boards were prepared, each having arranged upon it samples of various well-known electrical wires, one sample upon each board being the "Salamander Wire." All samples upon the boards had the same size conductor, and were carefully wired together into a circuit, the plan being to test them in comparison and under the same conditions.

These sample boards represented sixteen leading makes of insulated wires, several of them being claimed by their makers to be fire-proof. A powerful electrical current was then applied, and maintained until the conductor was first brought to a red heat, then a white heat, and in some cases, melted. Under this intense heat, every one of these samples except the "Salamander" was wholly destroyed, in several instances setting fire to the board and blazing all around the "Salamander," but in no case did sufficient heat escape through the "Salamander" covering to discolor the board beneath it.

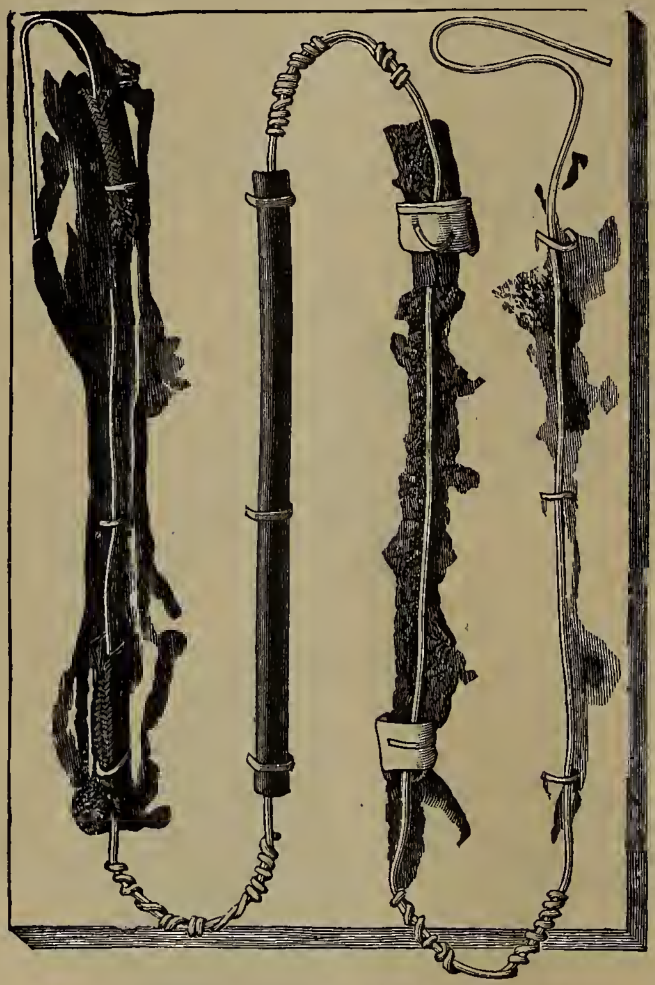
The accompanying illustrations represent the visible results of one of the tests. Fig. 1 shows a board ready to have the current applied, and Fig. 2 shows the same board after the test. In place of the insulation of all the samples but the "Salamander" nothing is left but a dark brown or black mass melted down on the board. The sample of "Salamander," as will be seen, remains intact, and no one would ever suspect from its appearance that heat had ever been applied to it.

Those who witnessed the test, it is said, agreed that the "Salamander Wire" filled every requirement of a fire-proof electric wire. The company claims that the conductor within the covering can actually be melted without damage to the insulation.

Among those who witnessed the tests above referred to were members of the National Board of Fire Underwriters.

A TROLLEY SWITCH.

The New Haven and West Haven Electric Railway, New Haven, Conn., has equipped its line with a device which is calculated to minimize the danger of receiving shocks from wires that may fall across the trolley wires, also for cutting off the current in any section of the line where firemen may be at work. It is called the "Trolley Knife-switch system," and consists of a switch placed in a box which is accessible by policemen or firemen. These boxes are placed at stated points along the line of the trolley and in case of necessity the switch is opened, thus cutting off the current on the section of the line controlled by it. In every police and fire-alarm box is placed a key to the nearest switch-box, and in case of a broken wire or a fire if it is found necessary to cut off the current a policeman opens the police or fire alarm box, gets the key to the trolley switch and cuts off the current.



SALAMANDER WIRE—AFTER THE TEST.

FUNERAL OF DR. SIEMENS.

The funeral of Dr. Werner von Siemens took place in Berlin on December 11, last. The London, Vienna and St. Petersburg Siemens factories were each represented by ten officials and ten workmen. Mr. Thomas A. Edison sent a wreath of flowers. Many state officials and numerous members of artistic and scientific societies also attended the services.

IMPORTANT EVENTS IN 1892.

January 2.—Mayor Boody, of Brooklyn, vetoes the resolutions passed by the board of alderman on Dec. 21, 1891, granting to Brooklyn City R. R. Co., the Atlantic Ave. R. R. Co., the Coney Island and Brooklyn R. R. Co., and the Brooklyn City and Newtown R. R. Co. the right to substitute electricity for horses on their lines.

January 11.—Brooklyn board of alderman re-introduced original trolley resolutions vetoed by Mayor Boody and passed them by a vote of 15 to 4. No effort was made to override the mayor's veto.

January 13.—Board of railroad commissioners at Albany approved application of the Brooklyn City and Newtown Railroad Company to change to trolley system.

February 5.—Consolidation of the Edison General Electric Company and the Thomson-Houston Electric Company announced.

February 8.—Charles McIlvaine executed by electricity at Sing Sing prison.

February 13.—Severe electric storms causing disturbance on telegraph lines.

February 14.—Telephone Exchange, 18th street, New York, damaged by fire.

February 23–25.—Fifteenth convention of the National Electric Light Association, Buffalo, N. Y.

March 1.—Judge Shipman, of the United States Circuit Court, handed down a decree in the suit of the Brush Electric Light Company against the United States Electric Lighting Company for an injunction restraining the latter company from using the double-carbon lamp. A perpetual injunction against the United States Company was granted.

March 28.—Jeremiah Cotto was executed to-day by electricity in Sing Sing prison.

March 29.—Annual meeting Bell Telephone Co., Boston, and all old officers re-elected.

April—Governor Flower, of New York, approves the act to incorporate the General Electric Company.

April 21.—Annual meeting Electric Club, New York and election of officers for ensuing year.

Meeting of the New York Electrical Society at the Telephone Exchange, Cortlandt street, New York.

April 30.—The Electrical Age and Street Railway News, of New York, adopt their new (present) form.

Spring meeting of the Magnetic Club, held at the "Columbia" restaurant, Fourteenth street, New York. Hon. James D. Reid, guest.

May 2.—General Electric Company, filed with Secretary of State certificate of increase of capital from $100,000 to $50,000,000.

May 3.—Three patents issued to T. A. Edison on "Speaking Telephones," applications for which were filed, one on April 27, 1877. and two on July 20, 1877.

May 4.—First meeting of General Electric Co. and officers elected.

May 17.—Annual meeting American Institute Electrical Engineers at headquarters, New York. Dinner in evening at "The Arena."

May 18.—Annual meeting Westinghouse Electric Co., Pittsburg, Pa.

May 18.—Joseph L. Tice, executed by electricity in Auburn (N. Y.) prison. Ninth electrical execution.

May 25.—Reorganized New England Electric Club opened club-house, Boston, with appropriate ceremonies.

June.—Contract awarded to the Westinghouse Company for the incandescent lighting of the World's Fair.

June 6, 7, and 8.—General meeting American Institute Electrical Engineers, Chicago.

June 15 and 17.—Annual Convention Association Railway Telegraph Superintendents of America, Denver, Col.

June 16.—First annual convention Canadian Electrical Society at Hamilton, Ont.

June 22.—Commissioner of patents reversed decision of examiner-in-chief in awarding priority of invention to Edison for invention and use of carbonized paper or parchment filaments in incandescent lamps and awarded priority of invention to Swan.

July 14.—Annual meeting New York Electrical Society and election of officers for ensuing year.

July 16.—Magnetic storm of great severity, completely paralyzing the telegraph service throughout the country.

July 23.—Clam-bake given at Haute Rieve to electrical fraternity by the American Electrical Works, Providence, R. I.

July 27.—Magnetic Club's midsummer meeting at College Point, L. I.

Aug.—Sir John Pender, the cable king, made a Knight Grand Cross of the Order of St. Michael and St. George.

Aug. 9 and 10.—Eighth annual convention of the Association of Edison Illuminating Companies at Toronto, Ont.

Aug. 12.—Severe electrical storm, causing much disturbance on telegraph wires and cables.

Aug. 19.—Northwestern Electric Light Association organized at Marinette, Wis.

Aug. 19.—The Thomson-Houston Electric Light and Power Company and the Brush Electric Light Company, both of Buffalo, N. Y., file articles of consolidation with the secretary of state at Albany, under the name of the Buffalo General Electric Company.

Sept.—James F. McLaughlin, a well-known electrical inventor of Philadelphia, Pa, awarded gold medal of the Institute by the French Academy of Science and Arts.

Sept. 1.—Prof. Elihu Thomson, through Mr. Ernst Thurnauer, Paris, general manager for Europe of the Thomson-Houston Electric Company, offers prize for the best work on a theoretical question in electricity.

Sept. 12–15.—Street Railway Employés hold convention at Indianapolis, Ind., and organize under the name of Amalgamated Association of Street-Railway Employés of America.

Sept. 14–15.—Twelfth reunion of the Society of the United States Military Telegraph Corps and Old Time Telegraphers' Association in Omaha, Neb.

Sept. 20.—The Street-Railway Association of the State of New York held its tenth annual meeting at Saratoga. At this meeting an organization of supply men was formed under the title of the Material Men's Auxiliary Association.

Sept. 22–23.—Beautiful electrical displays during reunion Grand Army veterans in Washington, D. C., under auspices of the General Electric Company.

Sept. 24.—Lightning kills a number of valuable dogs in the kennel-yard of the Brooklyn Gun Club, at Smithtown, L. I.

Sept.—Preliminary steps taken for formation of an electric club in St. Louis, Mo.

Oct. 4.—The U. S. Circuit Court of Appeals hands down decision in lamp case in favor of Edison Electric Light Company against the United States Electric Lighting Company.

Oct. 4.—United States Circuit Court of Appeals renders decision in favor of defendant and appellant in suit of Swan Electric Light Company, of New England, against the Brush Electric Company.

Oct. 4.—Judge Shipman, in the United States Circuit Court of Appeals, handed down a decision in favor of the Brush Electric Company in the suit brought against it by the Electrical Accumulator Company.

Oct. 4–6.—American Electro-Therapeutic Association held its second annual meeting at New York Academy of Medicine.

Oct. 12.—Magnificent electrical display by the General Electric Company in the evening during the Columbian festivities.

Oct. 18.—Long-distance telephone New York–Chicago opened to the public.

Oct. 19–21.—The American Street Railway Association held its eleventh annual meeting in Cleveland, Ohio.

Nov. 16.—Ohio State Tramway Association held its annual convention in Zanesville, O.

Nov. 18.—The General Electric Co., in the name of the Edison Electric Light Co. and the Edison General Electric Co., commenced suit in equity in the United States District Court, to restrain the Sawyer-Man Electric Co. from manufacturing incandescent lamps. Injunction granted.

Dec. 15.—United States Circuit Court of Appeals sustains the decision of the District Court in granting injunction against the Sawyer-Man Electric Co. in the suit of the Edison Electric Light Co., restraining the Sawyer-Man Company from manufacturing incandescent lamps.

NECROLOGY, 1892.

February.—E. T. Lynch, Jr., a prominent electrical engineer, New York.

February 3.—George Worthington, in Buffalo, N. Y.

March 18.—C. J. Van Depoele, in Lynn, Mass.

April 16.—A. B. Uline, General Manager Hudson River Telephone Company, Albany, N. Y., at Nassau, N. P., aged 56 years.

June 7.—E. V. Cavell, General Manager STREET RAILWAY NEWS, of New York, at Nassau, N. P., aged 34 years.

July 12.—Cyrus W. Field, at Ardsley, near Dobb's Ferry, N. Y., aged 73 years.

August 30.—At Ottawa, Ont., Frederick Newton Gisborne, Superintendent of Telegraphs of the Dominion of Canada.

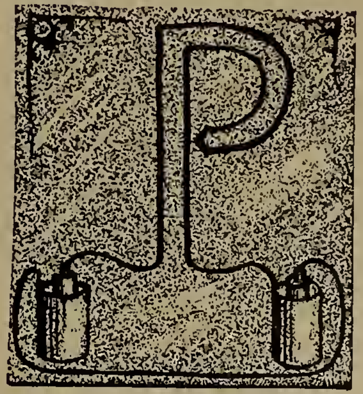
December 6.—Dr. Werner von Siemens, in Berlin, Germany, aged 76 years.

THE plant of the United States Electric Company, Dubuque, Ia., was sold on December 24 to a local syndicate, and it is thought that a consolidation of electric interests in the city will be effected. The price paid for the plant was $100,000.

AT the recent annual meeting of the electric-light company of Fort Edward, N. Y., the old officers and directors were re-elected for the ensuing year.

PRIMARY BATTERIES.

BY G. EMIL HESSE.



PRIMARY batteries were the first practical source from which electricity of commercial value was obtained. It was before the introduction of the dynamo used for producing electric light, power, etc., but very small progress was made on account of the great cost of running a powerful battery. This is really the only reason why such poor results have been obtained, and it is really a pity that such is the case, because it is the ideal way of producing the electric current.

We can produce heat in many ways. For example, if we have a mechanical force, such as that generated by a steam-engine, and utilize this power to produce heat for some purpose, we would agree that it was a very uneconomical way and by no means the ideal one. This is just exactly the system that we have to deal with when we produce electricity by first raising steam and then utilizing this power to drive the dynamo. The ideal way of producing heat is the present one—namely, by oxidizing carbon in whatever form it may appear—and this would also be the most desirable method for producing electricity. There is not yet, however, any method discovered by which coal can be slowly oxidized, heat being produced when the process is rapid. There are nevertheless other substances that will answer the same purpose, but the trouble is that the suitable material is very expensive, as the case is with zinc, this being practically the only metal that can be used to advantage.

We frequently hear about primary batteries that will do wonders at a cost of—well, practically nothing, as one enterprising manufacturer advertises. There is very little if any room at all in the improvement of the battery as handed down to us by Daniell, Bunsen and Grove, at least with regard to the efficiency, which is the principal thing next to the cost of running it. The great trouble with the majority of inventors in this line is that they do not know the scientific principles that the battery is based on, nor the theoretical effect in kilogram-meter of zinc, which of course cannot be exceeded under any circumstances. We know that electricity comes next after light in the chain of vibration, and it stands to reason that the more rapid the oxidation the more rapid the vibration. This is, nevertheless, not the case in the battery, and the slower the oxidation takes place the more electricity is produced at the expense of heat, this latter being really the only other sign of force noticeable.

The mechanical power stored in zinc or any other combustible material is measured by so many thermal units that one kilogram of the material will produce through perfect combustion with oxygen.

One kilogram of zinc will produce 1,301 thermal units. We find therefore that this is in kilogram-meter $= 1301.424 \times 551624$, which in H. P. per hour is $\frac{551624}{75 \times 60 \times 60} = 2.04$ H. P., or in other words, one kilogram of zinc will produce a theoretical effect of 2 H. P. during a period of one hour. No earthly power can increase this, and the fact is, that we never are able to reach this figure with the very best batteries. Still, this mode of producing power is one of the nearest to perfection that man has yet devised. Actual experiments made show that a good battery gives 90 per cent. electricity and 10 per cent. heat—a result the more gratifying when we recollect that the best triple-expansion steam-engine only gives 14 per cent. of the theoretical force stored in coal. The actual efficiency of one kilogram of zinc is therefore 1.8 horse-power-hour.

If, as a comparison, coal could be used instead of zinc the result would be, per kilogram, 9.68 actual H. P. in one hour, which of course is very favorable for the coal, even without considering the great difference in price.

Where the primary-battery inventors should concentrate their efforts is, therefore, not to try to fight against the impossible, which only will bring defeat, but to utilize everything that science offers, and if it is not possible to arrive at a desired result in one way to try another, but always being sure that the theory is correct.

Many people think that inventions are the results of one moment, but a little reflection will convince any one that it takes as much preparation to be an inventor, especially in electricity, as it takes to be a physician or a good mechanic.

People have tried to improve the battery, but how many have tried to reduce the salt that is produced when the zinc is consumed? There is, for example, no trouble to decompose water into its constituents, oxygen and hydrogen, and *vice versa*, and why should it be impossible to liberate the zinc in the sulphate of zinc on an economical basis?

It is to be regretted that every effort to produce electricity direct from coal has hitherto been without any practical result, but we have good reason to believe that the idea will not be abandoned until success has been achieved, and there is no doubt but that this is one of the most promising fields for the scientific inventor.

SUPPLY MEN'S ASSOCIATION.

The following is a copy of a notice being sent out by Mr. Jos. E. Lockwood, secretary of the Detroit Electrical Works, which is self-explanatory:

DETROIT, MICH., December 19, 1892.

DEAR SIR: As the report of the committee which I, as chairman of the meeting of supply men, held at the Cleveland Street Railway Convention, appointed for the purpose of consulting with the executive committee of the American Street Railway Association, was not received in time to allow of the calling of a meeting of the supply men before the close of the convention, and realizing that all supply men are interested in this matter and desire a knowledge of this report, I give you same herewith, as follows:

CLEVELAND, O., October 20, 1892.

MR. JOS. E. LOCKWOOD, Chairman.

DEAR SIR: The undersigned committee appointed by you to confer with the executive committee of the American Street Railway Association, beg to submit the following report: That a majority of the committee waited upon the executive committee of the American Street Railway Association, at their headquarters at the Hollenden Hotel, and briefly stated the case, as the time had then arrived for the convening of the association, and wanted to settle the matter definitely for the present. It was moved by Mr. Lang of the executive committee, and unanimously carried, that it was the sense of the executive committee that the association of supply men, such as was contemplated, *was not necessary at the present time.*

Respectfully submitted,
DANIEL COOLIDGE,
WM. P. CLARK,
JAS. H. MCGRAW,
PAYSON K. ANDREWS,
LOUIS E. MYERS,
Committee.

Trusting that this report will give you all the information regarding this matter that you desire, I remain,

Respectfully yours,
JOS. E. LOCKWOOD,
Chairman.

ELECTRICAL SOCIETIES.

CANADIAN ELECTRICAL ASSOCIATION.

The association will hold its next meeting at the School of Science, Toronto, Ont., January 25 and 26.

BROOKLYN INSTITUTE OF ARTS AND SCIENCES.

Mr. Albon Man will deliver a lecture before this institute on Friday, January 13, at 8 P.M., entitled "What is Electricity; is it Force, or only Matter?"

On January 20 Mr. Edward H. Lyon, of New York, will deliver a lecture before the same institute on "The Long-Distance Telephone," illustrated by lantern photographs and by a series of long-distance instruments. A feature of this lecture will be the transmission to the lecture hall of the music of a band in Chicago.

The first-named lecture will be held in the Art Association Building, 174 Montague street, and the latter in Association Hall, Fulton street.

THE ST. LOUIS ELECTRIC CLUB.

The Electric Club of St Louis, whose organization was recently announced in these columns, is now in full operation, and settled in elegant quarters. It has received its charter, and there is every indication that it will rank second to none among like institutions in the country. The club's quarters are in the Equitable Building, corner of Sixth and Locust streets, and consist of two rooms on the second floor. They are well ventilated and lighted by electricity. One of the rooms has been fitted out as a general lounging, reading and reception room, and the other will be furnished as a billiard and smoking room. The furnishings of the rooms are elegant, and in every way they will be made attractive to the members. The club began the new year with ninety members, and there is every prospect that it will continue to increase in size and enthusiasm. The club will welcome the attendants at the convention of the National Electric Light Association, which will be held in St. Louis February 28, March 1 and 2 next.

Mr. James I. Ayer, general manager of the Municipal Electric Light Company of St. Louis, and president of the National Electric Light Association, is one of the leading spirits of the club, and with his enterprise and energy he will make it a big success.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The 73d meeting of the American Institute of Electrical Engineers will be held at the headquarters of the institute, 12 West 31st street, Tuesday, January 17, at 8 P.M.

The paper to be presented is entitled "Electrical Recording Meters," by Mr. Caryl D. Haskins, manager of the meter department, General Electric Co., Boston, Mass.

Beginning with this meeting the new arrangement for the publication of papers goes into effect, by which the advance copies usually printed for the use of those in attendance will be made the regular mail edition of the transactions, and it is the intention that they shall reach the membership on or before the date of the meeting.

NEW YORK ELECTRICAL SOCIETY.

The 150th meeting of the society will take place on Wednesday, January 11, 1893, at 8 P.M., at Columbia College, Madison avenue and 49th street. Mr. Augustus Noll, general superintendent of the New York Electric Equipment Co., will give "A Practical Talk on the Installation of Isolated Electric Lighting Plants."

The lecturer will also illustrate the method of calculating the size of conductors required by working out an actual example.

ELECTRICAL DENTAL APPARATUS.

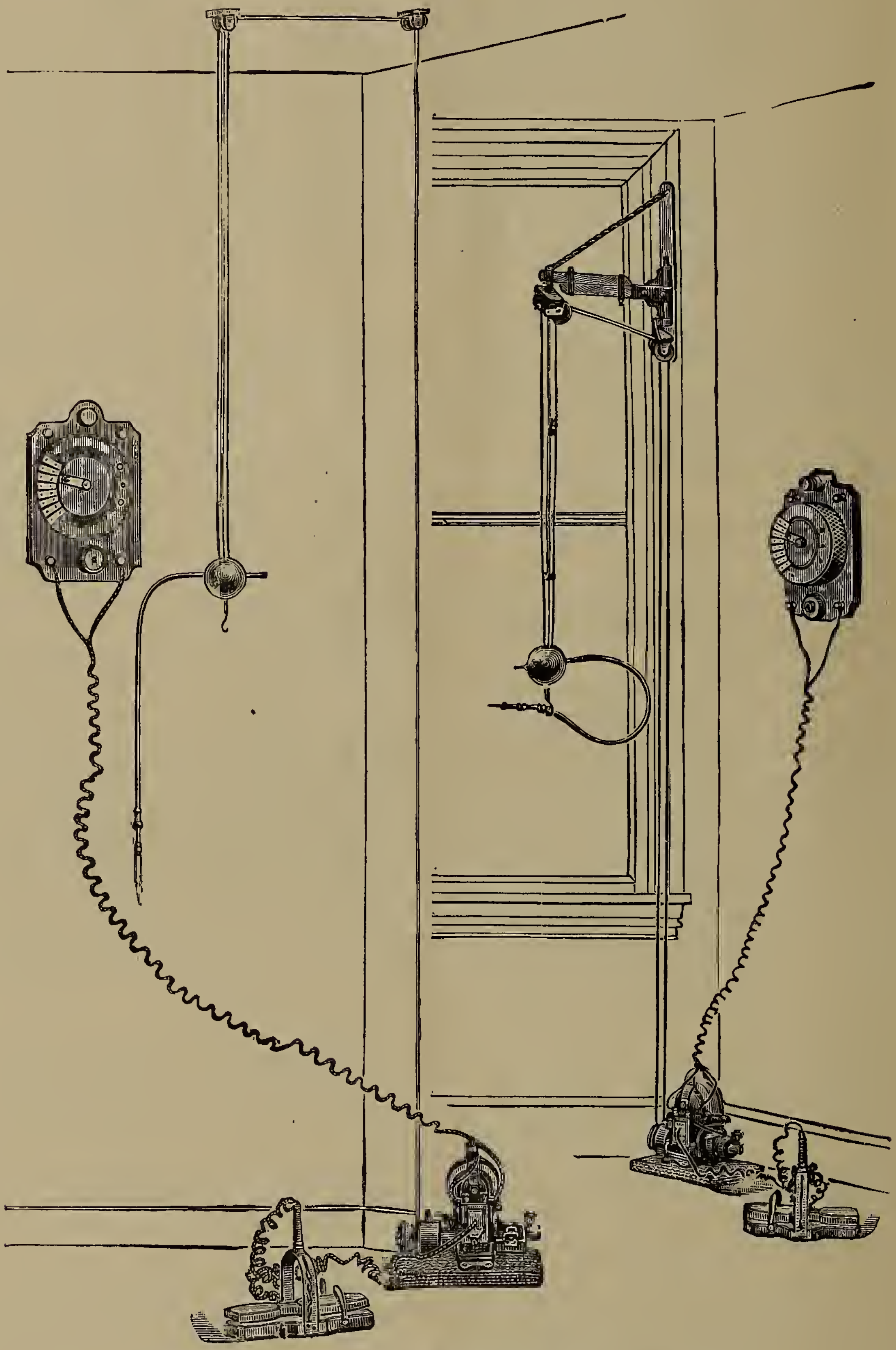
All first-class dentists are now using electric power for the operation of the various apparatus used in dentistry.

This form of power is so convenient and so easily applied that the dental profession are quite enthusiastic over it, and anything new in this line is always of deep interest to them.

We illustrate herewith the Williamson Suspension Dental Engine manufactured by the S. S. White Dental Manufacturing Co., of Philadelphia, which possesses some valuable and interesting features. Electricity in connection with the standard dental power-transmitter is the driving force. The apparatus is noiseless in its operation, and is absolutely free from the motion inherent in other forms. This contributes very materially to delicacy of manipulation.

A hollow sphere has a shaft journalled through its centre, to which is attached an S. S. White flexible arm. The sphere is parted at the middle by a slip-joint, the two halves being held together by a screw at the bottom. Within one-half of the sphere the shaft carries a pulley, the wall of the other half being considerably thickened to serve as a counterbalance to the weight of the arm and hand-piece.

The driving-cord reaches the pulley through two tubes let into the top of the sphere, thence it passes over the pulleys at the point of suspension, and from there by means of guide-pulleys to the motor. Attached to the frame of the suspension-pulleys is an adjustable safety-cord (seen in the illustrations between the going and returning driving-cord), which runs to the inside of the sphere, for the purpose of sustaining the engine in case of breakage of the driving-cord.



THE WILLIAMSON SUSPENSION DENTAL ENGINE.

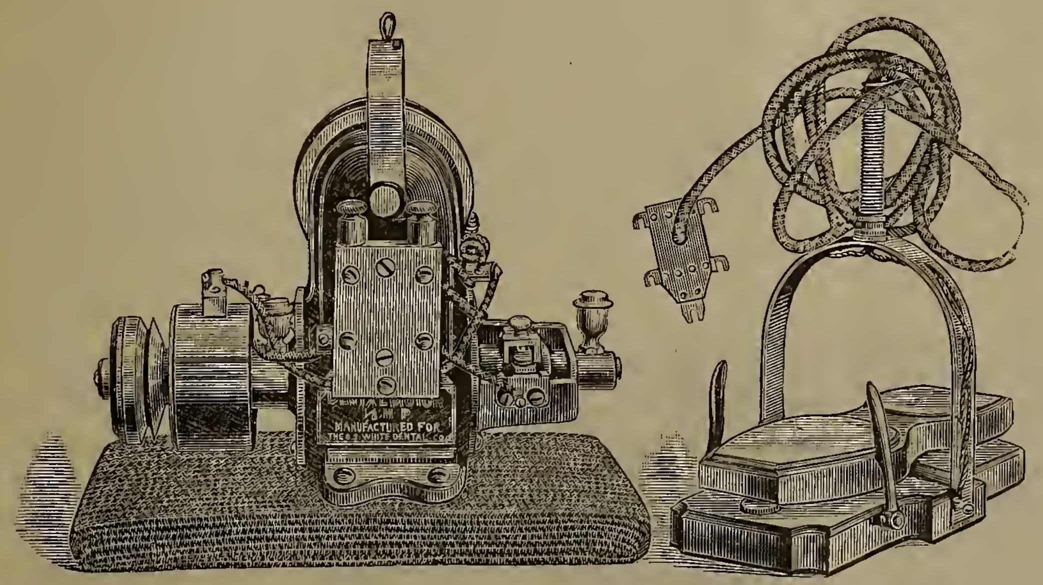
At the bottom of the sphere is a hook to serve as a holder for the hand-piece when not in use. An additional hook is furnished, to be attached to the wall at any convenient point to permit the entire engine to be swung out of the way when desired.

The sphere, which is of brass, nickel-plated, is 3¼ inches in diameter, outside measurement. The entire weight of the engine, including sphere, arm and hand-piece, is about 2 pounds 6 ounces. The reverse motor and treadle (Fig. 2) are used with this engine, and the variable resistance is the same as that used in Nos. 4 and 5 of the Kells system. With these it can be run in either direction at any desired speed, and can be stopped instantaneously by a movement of the foot.

On the left side of the illustration is shown the method of suspending the apparatus from the ceiling, and on the right from a suspension-crane.

These engines are very efficient and giving complete satisfaction.

Fig. 2 shows the reverse motor and treadle. In the base of the treadle is a switch controlled by a sliding-rod, which is operated by a metal upright at either side. With the foot upon the treadle, bearing down upon the heel closes the circuit; pushing out the right-hand upright gives the engine a forward or right-hand motion; pushing out the left-hand upright reverses the motion and runs the engine backward, to the left; pressing down the toe stops it instantly, in whichever direction it is running.



REVERSE MOTOR AND TREADLE.

Attached to the treadle is a cable 10 feet long, carrying five connecting wires, terminating in an insulated plate having five lugs or arms to connect with the motor. The motor is wound for the 110-volt incandescent electric circuit.

JOURNALISTIC.

Milan W. Russell and John H. Glover have purchased the sole interest in the TELEGRAPH AGE, which has heretofore been owned and published by the Electrical Age Publishing Company. Mr. Russell has been editor of the paper for nearly two years, and Mr. Glover was associate editor of the ELECTRICAL AGE and STREET RAILWAY NEWS, so that the paper does not fall into inexperienced hands by any means. Both gentlemen have a large acquaintance in the telegraph field, and under their sole and independent control there is no doubt that the paper will continue to grow in influence and circulation. The new proprietors are gentlemen of ability and have a keen appreciation of the wants of their constituents, and we wish them every success in their enterprise.

A PETITION signed by several hundred of Milwaukee's citizens was presented by Alderman Leidel, calling attention to the smoke nuisance created by the Edison Electric Illuminating Company's plant. Mr. Leidel introduced a resolution directing the city attorney to draft a bill to be presented to the legislature, providing for the prevention of the smoke nuisance in Milwaukee.

THE Omaha (Neb.) Packing Company has awarded the contract for the construction of a 400-light electric plant to Joseph T. Smith. United States slow-speed dynamos will be used.

TELEGRAPH DEPARTMENT.

THE Commercial Union Telegraph Company has been leased by the Postal Telegraph Cable Company for 99 years from January 1.

THE annual report for 1891 of F. C. Mason, superintendent of telegraph of the department of police and excise, Brooklyn, makes an interesting showing. The force of the telegraph bureau consisted at the time of the report of one superintendent, 7 operators and 4 linemen. The total number of messages handled during the year was 187,688. The department, at the date of Mr. Mason's report, had in use 285 sets of telephones which it rented from the New Jersey Telephone Company and 25 sets of dial telegraph instruments. It has also in use 350 cells of gravity battery, 20 cells of carbon battery, 35 sets of 3 and 5 cells Smee battery, 75 cells of Leclanche and 275 cells of dry battery. The Gamewell Police Patrol telegraph system is in use and "is giving the utmost satisfaction, and cannot be too highly recommended." There are sixteen booths in use in connection with this system. Eleven precincts of the 12 covering the city are equipped on the patrol system of Paerce & Jones, of New York; the apparatus of each "station" being enclosed in iron boxes that can be attached to a telegraph pole or the wall, similar to the fire-alarm boxes. Mr. Mason reports that the system is doing excellent service. Okonite cables placed on the elevated railroad structures are giving entire satisfaction. Mr. Mason reports that under severe tests they showed no signs of being injured, and their insulation remains as high as it was when they were placed in position. There are 2,000 feet of ten conductor okonite cable placed underground.

A FEW days ago Mr. Frank J. Mahon, chief operator of the Canadian Pacific Telegraph Company, St. John, N. B., made some experiments in long-distance telephony over the C. P. R. telegraph wires. Conversation was carried on with remarkable ease and clearness between St. John, N. B., and Bangor, Me., a distance of 250 miles. At the time the temperature was 6 degrees below zero and a gale of wind was blowing.

PROMINENT telegraphers in New York city are arranging for a telegraph tournament on March 11 next. The contest will probably be held in Hardman Hall, corner 5th avenue and 19th street, and the enteries will be open to all comers. There will also be a ladies' class.

MISS WINNIE CHASE, a telegraph operator of Denver, Col., and George Wagner, an operator at Wichita, Kan., will be married on February 10. Their courtship has been conducted entirely by telegraph, the parties working at opposite ends of the same wire, and it is said they have never seen each other.

THE strike of the telegraph operators on the Chicago, Rock Island and Pacific R. R. was declared off on January 5. It is said the men were poorly organized.

PERSONAL.

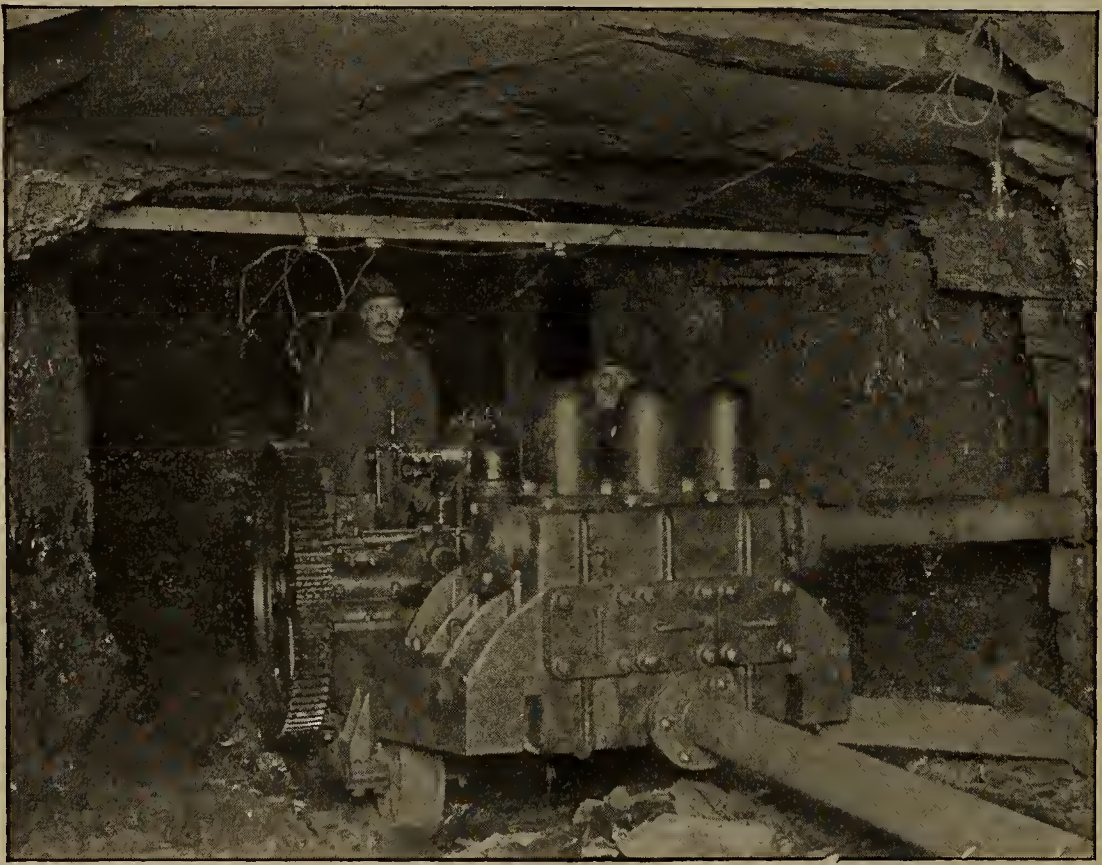
MR. F. W. BEST, formerly with the F. W. Best & Co., Denver, Col., has been appointed eastern representative of the new monthly magazine, *World's Fair Electrical Engineering*, with headquarters in the Tribune Building, New York city.

CAPTAIN WILLARD L. CANDEE, American manager of the Okonite Company (Limited), New York, sailed December 31 last, on the North German Lloyd steamship "Saale" for London, on business connected with the company.

ELECTRICAL MINE-PUMP.

An excellent example of the manner in which electricity is displacing steam in the mining industry is given by the recent installation in the William H. colliery, of the Connell Coal Company, located in Duryea, Pa. This colliery is considered one of the most important mines in its district, the average daily output being about 1,200 tons. Many improvements have been made in the plant which will enable the mine to turn out from 1,400 to 1,500 tons per day.

The feature of greatest interest in the improved plant is the electric pump. This is the first electric pump introduced in the mines of that section, and its successful operation is being watched with great interest by all interested in mining matters. The pump is of the horizontal, triplex or three-plunger style, with 6½-inch plungers and 8-inch stroke. It makes 42 revolutions per minute, and, in its proper location, throws a steady, solid stream of water through a 4-inch pipe a distance of 500 feet from the lower workings to the main-pump. The capacity of the pump is 500 gallons per minute. Its entire weight inclusive of the operating motor is 6,000 pounds. The electric motor is a 7½ horse-power General Electric Company motor, and the generator, constructed by the same company, and located in the main engine-house on the surface, is of 10 horse-power. The power is transmitted to the motor over copper wires, running down through the air shaft and along the roof of the mine for a distance of 1,700 feet. The pump and motor are mounted upon a wheeled truck, and can thus readily be transported to any point in the workings. This feature alone is a strong recommendation to mine managers. The claim of the General Electric Company that the electric pump needed considerably less attention than the steam pump has been heartily admitted by the managers of the colliery.



ELECTRICAL MINE-PUMP.

By the use of the electric pump a great danger in this mine has been obviated. The steam from the steam pump formerly used penetrated the roof of the mine in its vicinity, loosening the rock, and rendering the possibility of its fall always imminent.

Besides furnishing power for the pump the electric generator on the surface supplies current to the incandescent lamps, which light the engine-houses, the head of the shaft, the inside pump-house, and the workings about the foot of the main shaft. The contrast between the incandescent lamps attached to the roof along the main gangway and the illumination sparsely distributed from the ordinary miner's lamp is most striking.

If after a few months' trial of the new system of lighting and pumping it is pronounced successful, the colliery company intends still further to utilize electricity in its mine, and put it to other uses, such as to operate drills and locomotives. It greatly surpasses steam or compressed air for the operation of drills, or mule, rope, or steam haulage for that of locomotives.

The electric period in coal-mining is fast advancing, and mine managers and owners of a progressive nature recognizing this are vigilantly watching new developments in this direction.

NOTES OF GENERAL INTEREST.

An electric-light plant has been installed in the Post-Office Building in Toledo, O., by the Southern Electric Light Company, of Baltimore, Md.

An interesting lecture on practical electricity was delivered by Morris K. Mead, chief of the electrical bureau of Pittsburg, Pa., on December 21, before the students of the Duquesne College. Mr. Mead illustrated his lecture with diagrams, and had on exhibition a city fire-alarm box, an electric meter and several machines used by the electric-car companies.

The various fire-department houses in Salem, Mass., will in the future be lighted by electricity. The necessary equipment has already been fitted up.

The equipment of the power station of the Taunton (Mass.) Electric Light Company will be increased by three new boilers and a 200 H. P. engine.

Work has been commenced on the power-plant for the new Citizens' Light and Power Company, of Rochester, N. Y., on Brown's race. Efforts will be made to have the plant in operation by April next.

A discharged employé at the Camden mines, in Mason county, W. Va., set fire to the electric-light plant, all of the costly machinery and buildings being completely destroyed. Loss, $15,000.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Adams, Mass.—The electric-light company here contemplates increasing its plant, and the Berkshire Cotton Company intends to build a third mill.

Attleboro, Mass.—There is a possibility that electric lights may be introduced in this place. Mr. W. P. Whittemore, superintendent of the water-works, is interested in the movement.

Boston, Mass.—A proposition has been made to establish an electric-light plant at Deer Island, one of the city institutions.

Braintree, Mass.—A. S. Morrison & Bro., Stephens & Willis and the Fore River Engine Company are after the right to supply electric lights for this section. The town now owns its own plant.

Bristol, Vt.—The electric-light plant here, which was recently put into operation, will soon be largely increased and the lights will be extended to Lincoln next spring.

Clyde, O.—There is a strong desire here for the introduction of electric light.

Fergus Falls, Minn.—An electric-light plant is to be established at a dam one mile below the city, to supply lights in this place.

Franklinville, N. Y.—A movement is on foot here to introduce electric light.

Hawley, Pa.—There is an opportunity for some one to introduce electric lighting here, using the power of the falls.

Irvington, Ind.—A petition has been presented to the town board by the property owners for the establishment of an electric-light plant for public and private lighting.

Jamestown, N. Y.—It is proposed to extend the city electric-light plant, the improvements to cost $15,000.

Manor, Pa.—The people of this place are somewhat impatient for an electric-light plant.

Milford, Mass. — The Electric Light and Power Company will probably erect a larger building, as its present quarters are inadequate.

Palmyra, N. Y.—The citizens of this place are in favor of the introduction of an electric-light system, and the village board is ready to grant a franchise to a reliable company.

Ridgway, Pa.—The Ridgway Electric Light Company contemplates the enlargement of its plant to double its present size.

Springville, N. Y.—There is a sentiment here in favor of the establishment of an electric-light plant.

Taunton, Mass.—The electric-light company of this place is making extensive additions to its plant, and has already contracted for three new boilers and a 200 H. P. engine. The enlarged plant will have a capacity of 5,000 incandescent and 300 arc lights.

Westborough, Mass.—A movement has been started with a view to the extension of electric lights on various streets.

Woodhaven, L. I.—The town board has under advisement a proposition to establish an electric-light plant.

Greene, N. Y.—The offer of the Greene Electric Light Company to light the streets with incandescent lights has been accepted.

McMinnville, Tenn.—The Tennessee Woollen Mills of this place contemplate the installation of an electric-light plant and wishes to correspond with contractors.

NEW CORPORATIONS.

Columbia, Pa.—The Columbia and Washington Street Railway Company. Capital stock, $40,000.

Detroit, Mich. — Detroit Metropolitan Street Railway Company. Capital, $50,000.

Doylestown, Pa.—Doylestown, Dublin and Perkasie Railway Company. Capital, $150,000.

Longview, Tex.—The Longview Electric Light and Power Company has been incorporated with a capital stock of $10,000. Incorporators: S. M. Moberly, W. C. Payne and others.

New York, N. Y.—Columbus and Ninth Avenue Railroad Company. Capital, $3,000,000.

Pavonia Ferry Railroad Company. Capital, $5,000,000. The directors of both corporations are: A. N. Brady, of Albany; Philip E. Bray, John Seage, Howard Vansideren, Edward Ferrero, James J. Traynor, John J. Cumming, James R. Breen and Samuel Goldsticker, of New York city.

Philadelphia, Pa.—The Columbia and Washington Street Railway Company. Capital, $40,000.

EXTENSIONS.

Amsterdam, N. Y.—The Amsterdam Street Railroad Company has petitioned the common council for permission to lay tracks through a number of streets in order to reach Rockton.

Chelmsford, Mass.—A petition has been filed with the selectmen by the Lowell and Suburban Street Railway Company for permission to extend its present system about half a mile.

East Providence, R. I.—The Union Railroad Company has been granted permission to extend its line and to operate its cars by the trolley system.

Lawrence, Mass.—The board of aldermen has granted the Merrimack Valley Street Railway Company permission to lay double tracks north to the Methuen line and south to Andover street.

New York, N. Y.—The Third Avenue Railroad Company has declared its intention to extend its lines some 4½ miles and also build a branch line.

Worcester, Mass.—The new management of the Consolidated Street Railway Company has decided to petition for permission to double track its entire system.

CHANGE OF POWER.

Alton, Mo.—The Alton street-car lines have been purchased by a syndicate of stockholders of the Chicago, Burlington and Quincy railroad, and the lines will be converted into an electric system.

Olean, N. Y.—The Olean street railway will adopt the trolley system.

Philadelphia, Pa.—The Frankford and Southwark Passenger Railway Company has petitioned the council for permission to change the Fifth and Sixth street line into an electric system.

San Francisco, Cal.—The Consolidated Piedmont Cable Company has applied for permission to substitute electric-power on its line to Mountain View Cemetery.

Taunton, Mass.—A New Bedford syndicate has bought the Taunton street railway and will equip the road with electricity.

NEW ROADS.

Buffalo, N. Y.—In furtherance of the proposition to establish a trolley line from Buffalo to Niagara Falls, W. Caryl Ely appeared before the Tonawanda board of trustees and asked for a franchise through that place.

Bridgeport, Conn.—Watson J. Miller and Aaron R. Smith have signed a petition for permission to operate a street railway by horse-power or electricity.

Columbia, Pa.—A street railway is to be constructed from this place to Washington by the Columbia and Washington Street Railway Company.

Dedham Centre, Mass.—It is reported that an electric railway is to be constructed between this place and Boston.

Detroit, Mich.—The Citizens' Street Railway Company has petitioned the board of aldermen for extension of its franchise. This extension covers practically the same territory as the petition of James F. Joy and others, presented a short time ago.

Homer Warren, R. H. Fyfe, Collins B. Hubbard and others have petitioned for leave to build a new street-railway system.

Doylestown, Pa.—An electric road twelve miles long is to be constructed between this town and Perkasie, by the Doylestown, Dublin and Perkasie Railway Company.

Fall River, Mass.—An electric road is projected between this city and New Bedford.

Gettysburg, Pa.—The council has granted the electric-railway company right of way over all the principal streets, and the company will build a line over the battlefield.

Jersey City, N. J.—It is rumored that an electric street railway will be constructed and operated before next spring from Exchange Place depot to Newark, Paterson and Elizabeth.

Kansas City, Kan.—George I. McCarten, C. F. Buchhalter and others have applied for a franchise to build and operate a street-car line by compressed air.

Arrangements are being completed for the construction of an electric line from the terminus of the Grand Avenue Street Railway Company's Holmes street cable line to Forest Hill Cemetery.

Lewiston, Me.—The construction of an electric road between this city and Auburn has been decided upon.

Millville, N. J.—The Millville Rapid Transit Company, Walter Douglass, president, has petitioned for a franchise to establish a street railway.

Mount Auburn, Mass.—An electric railway is projected between this place and Arlington, it will be about four and a half miles in length.

New Bedford, Mass.—A company has been organized under the name of the Dartmouth and Westport Street Railroad Company for the purpose of establishing a road between New Bedford and Fall River.

Norristown, Pa.—A syndicate, represented by James Rawle, of the J. G. Brill Company, Philadelphia, has secured control of the horse railroad and will convert it into a trolley road.

Newark, N. J.—The Newark and South Orange Railway Company has received permission to run electric cars through several streets of the city.

Nevada City, Cal.—An electric road is to be built between this city and Grass Valley.

New York, N. Y.—The board of aldermen have granted the Union Railway Company permission to use overhead electric wires on some of its projected roads in Harlem.

The Columbus and Ninth Avenue Railroad Company and the Pavonia Ferry Railroad Company have been organized for the purpose of constructing and operating street surface roads in this city.

Ocean City, Md.—There is talk of an electric railway for this city.

Petaluma, Cal.—The prospects for an electric road to Santa Rosa are very favorable.

Philadelphia, Pa.—The council's committee has favorably recommended the passage of the ordinance permitting the Wissahickon Electric Railway Company to introduce the trolley cars in Wissahickon and Manayunk.

Roxborough, Pa.—It is reported that two electric railways will soon be running through this town.

San Francisco, Cal.—The street committee of the board of supervisors have recommended for final passage the Le Roy street-railway franchise.

Santa Rosa, Cal.—This place is to have an electric street-car system.

Stratford, Conn.—The proposition to build a horse railroad over Barnum avenue will meet with considerable opposition.

St. Louis, Mo.—There is a movement on foot to construct a railway from Fenton to this city.

Thomaston, Me.—It is reported that a street railway is to be constructed between here and Rockland.

Unionville, Conn.—The citizens of this place have applied for a charter to build an electric street railway to Hartford.

Wilmington, Del.—There is yet to be constructed six miles of the trolley road which is to connect Chester and Wilmington.

Woodbury, N. J.—The question of an electric railroad is being vigorously agitated.

Worcester, Mass.—There is said to be a scheme on foot to establish a continuous electric line between the two cities.

WORLD'S FAIR NEWS.

Director-General Davis has nominated Dr. J. A. Hornsby for the position of assistant chief of the Department of Electricity.

Foreign nations have been the earliest on the grounds. Domestic exhibits, on the other hand, have been delayed on account of the time it has taken to make the allotments. The fact should be impressed upon domestic exhibitors that the advantages of being represented early on the grounds cannot be over-estimated; this can be done without the personal attendance of the exhibitor, and the saving of a journey to Chicago, through the International Exhibitors' Association, Stewart Building, New York, which is fully prepared to care for the exhibits and interests of eastern and foreign exhibitors based on a co-operative plan.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, January 7, 1893.

Mr. Maybin W. Brown, manager of the Brown Electric Company, Boston, was in town last week.

Robert Goodchild, representative of the Boston Blower Co., is in town, having just returned from the West. He reports having done a large business while away.

Mr. D. B. Dean, of the McGuire Manufacturing Company, Chicago, is in town. He reports having closed a number of good orders for McGuire trucks in this section, and is pleased with the business outlook.

The Citizens' Electric Light Company, of Brooklyn, held its annual meeting on January 4. The following named gentlemen were elected trustees for the ensuing year: Hugh McLaughlin, James Shevlin, Anthony Barrett, Thomas Nevins and John Delmar.

Mr. Wm. A. Rosenbaum, the electrical expert and patent solicitor, of the Times Building, this city, reports business very brisk, and the outlook for electrical inventors and inventions to be good. We always find his office full of business.

Col. J. Frank Dillont, who is well known in the electrical trade through his former business relations with one of the electrical journals, is now manager of the New York office of the Massachusetts Chemical Company, of Boston. Col. Dillont's office is at 60 and 62 Broadway, and the company he represents is fortunate in securing the services of so able a gentleman to look after its interests in this section. W. T. H.

ELECTRICAL STOCK QUOTATIONS.

The following are the latest prices for electrical securities in New York, as quoted by Geo. B. Ellery, financial editor Electrical Age.

Names of Companies.	Capital.	Par.	Price.
American Dist. Tel., N. Y.	3,825,000	100 00	58 00
American Telegraph and Cable	14,000,000	100 00	87 00
American Visual Telegraph Co.	500,000	100 00	†75 00
Bell Telephone	17,000,000	100 00	206 00
Bell Telephone 7s	2,000,000		*113
Boston Electric Light Co	1,500,000	100 00	117 00
Brooklyn Edison Electric Light	1,500,000	100 00	104 50
Brooklyn Edison Electric Light, 5s	500 000		*100
Brooklyn Citizens' Electric Light	500,000	100 00	155 00
Brooklyn Municipal Light	500,000	10 00	17 00
Brush Elec. Lt. Co. pref., Balto	600,000	100 00	80 00
Brush Elec. Lt. Co., Balto., 5s	200,000		*105
Brush Elec. Ill., N. Y.	1,000,000	100 00	30 00
Brush Elec. Ill., 6s, N. Y.	300,000	100 00	*102
Brush Elec. Co., Parent		50 00	40 00
Brush-Swan E. L. Co. of N. E.	2,000,000	100 00	20 00
Burrell Electric Signal Co., N. Y.	500,000	20 00	10 00
Chattanooga Elec. Lt. Co., Tenn., 6s	200,000		*101
Chattanooga Elec. Lt. Co., Tenn.	100,000	100 00	92 75
Chicago Gas	25,000,000	100 00	87 75
Columbia Chronophone Co., Phila.	500,000	25 00	35 00
Commercial Cable Co	7,716,000	100 00	174 50
Cons. Gas Co., N. Y.	35,430,000	100 00	126 00
Cons. Subway Co., N. Y.	3,000,000	100 00	25 00
Detroit Elec. Lt. & P. Co	300,000	25 00	14 00
Detroit Elec. Lt. & P. Co. 6s	300,000		*101
Detroit Electrical Works	1,000,000	10 00	4 50
Direct U. S. Cable Co., Ltd	6,400,000	100 00	50 00
Edison Elec. Ill. 5s, N. Y.	3,050,000		*111
Edison Elec. Ill., Lebanon, Pa.	80,000	10 00	13 75
Edison Elec. Illuminating, N. Y.	6,500,000	100 00	115 00
Edison Electric Light Co., Phil	2,000,000	100 00	105 00
Electric Protection Co., N. Y.	100,000	100 00	75 00
Elec. Sup. & Con. Co., N. Y.	120,000	15 00	16 00
Electrical Forging Co	2,000.000	100 00	85 00
Elmira Municip. Imp. Co., 5s	1,800,000		par
Erie Telephone	4,800,000	100 00	50 00
Fort Wayne Elec. Co	4,000,000	25 00	13 00
Franklin Electric Co., N. Y.	5,000,000	100 00	†83 00
Fremont E. L. & P. & Gas Co., O.	95,000	100 00	102 50
General Electric Co.	50,000,000	100 00	112 25
General Electric Co., 5s	7,931,000	10 00	*100
General Electric pref.	4,223,700	100 00	116 00
Great West. Elec. Sup. Co. pref. 8s	350,000	10 00	10 00
Guarantee Identification Co., N. Y.	50,000	50 00	40 00
Hickory Electric Co., N. C.	12,000	100 00	112 00
Interior Conduit & Ins. Co., N. Y.	1,000,000	100 00	75 00
Int. Okonite, Limited	1,700,000	50 00	49 00
Laclede Gas Co	7,500,000	100 00	23 50
Laclede Gas pref.	2,500,000	100 00	70 00
Laclede Gas 5s.	10,000,000		*87
Law Telephone	400,000	100 00	96 00
Livingston E. Lt. Co., Mont., 6s.	30,000		*92
Marshalltown Elec. Co. 6s, Iowa	65,000		*98
Marysville L. & W. Co. 6s, Ohio	60.000		*98
McLeod Railway Equip. Co	3,000,000	25 00	35 00
Metropolitan Elec. Signal Co., N. Y.	1,500,000	100 00	35 00
Metropolitan T. & T., 5s	2,000,000		*103
Metropolitan Traction			136 25
Morristown L. H. & P. 5s, N. J	30,000		*102
Morristown L. H. & P.	50,000	100 00	101 00
Nat'l Elec. Manuf. and Const. Co., N. Y.	50,000	100 00	101 00
N. E. Tel. & Tel. Co	10,394,600	100 00	59 00
N. Y. and N. J. Tel. and Tel. 5s	1,500,000		*98
N. Y. and N. J. Telephone Stock	2,535.000	100 00	98 25
N. Y. Storage Battery	100,000	100 00	96 00
North American Railway Co.	39,767,200	100 00	10 25
Postal Telegraph	10,000,000	100 00	81 00
Peninsular Elec. Lt. & P. Co., Va.	30,000	10 00	9 50
Pettingell Andrews Co., Boston	200,000	25 00	30 00
Pittsburg Reduct. Co., Aluminum	1,000,000	100 00	105 00
Rockaway Elec. Light	50,000	100 00	40 00
Sawyer-Man Elec. Light Co., N. Y.	125.000	100 00	100 00
Shaver Corporation, N. Y.	100,000	1 00	8 00
Short Elec. Ry. Co., Cleveland, O.	5,000,000	10 00	8 00
Standard Ug'd Cable Co., N. Y.	1,000,000	100 00	80 00
Suffolk Electric Co., Boston	300,000	10 00	10 50
Swan Incandescent	800,000	100 00	6 00
The Gamewell Fire Alarm Tel. Co.	750,000	100 00	100 00
The Hall Signal Co., N. Y.	1,900,000	100 00	100 00
The Hall Signal Co. pref., N. Y.	100.000	100 00	115 00
The Ongley Electric Co., N. Y.	250.000	100 00	85 00
The Siemens & Halske Co., Ill.	500.000	100 00	par
The Washington Wat. Pow., Wash.	1,500,000	100 00	90
The Wells & French Co., Ill.	600,000	100 00	par
T.-H. Electric Co. 5s, N. Y.	500,000	30 00	*101
U. S. Rubber Co.	13,481,000	100 00	44 50
U. S. Rubber Co. pref. 8s.	12,942,500	100 00	98 00
Western Union	100,000,000	100 00	95 25
Westinghouse Elec. & Manf. Co.	7,000.000	50 00	35 00
Westinghouse Elec. Co. pref. 7s.	4,000,000	50 00	49 00
West Point W. Lt. & P. Co., Va.	25,000	100 00	101 00

*Per cent. †Registered stock.

FINANCIAL.

Wishing all my readers a prosperous and consequently Happy New Year, a full 100 per cent. wish for 1893, it is gratifying to them and to me to be connected with a business industry which at the outset contains so many positive elements of success as electricity. There are fewer worries, less uncertainty, fewer possible contingencies against over average profits in its lines than any other occupation in which a fair portion of the people can engage without creating a competition which will eliminate fair returns for capital and labor. There are comparatively few independent electrical combinations when a single factory or corporation turns out the completed article from the crude material but each step on the route is reaping a most satisfactory reward. The only sufferers are the inventors, whose discoveries have not found a market and whose available means are exhausted. To these the columns of the ELECTRICAL AGE are always open, and we feel it not only a pleasure but our bounden duty to offer our assistance. We propose to be abreast if not ahead of all our contemporaries and the times, with every electrical advance, and all new discoveries in the science which are practical. I shall at all times be ready and happy to lay the subject before capital. The position of the General Electric and the Westinghouse corporations are still much in the dark. Evidently the question of the incandescent lamp or a substitute which will be acceptable to the public, and the insurance, possibly the municipal people, is the grand factor in the case. Each company has sufficient business to continue, regardless of the incandescent lamp, and the public have been so thoroughly educated and reached such a feeling of security in their commercial and domestic illumination that it will require years to introduce a lamp to replace the present bulb. The financial status of both corporations is most satisfactory. Confidence was shown in the General Electric from the fact that 70 per cent. of the late issue of $6,000,000—5 per cent. bonds—was underwritten for the very low commission of one per cent., and the whole bond issue is quoted at par with every reason to expect them to raise to at least 110 during the early part of the year. The shares still dally between 110 and 120, and it is a problem as to how high they will go by January 1, 1894. The preferred shares are not much dealt in in this market, but in Boston they stand very steady at 116. On the other hand the Westinghouse 7 per cent. preferred are quoted regularly at $50 or par, and close the year a point or two below it. The common stock stands at 38, notwithstanding the ridiculous reports which are published, and which appear the more so when we consider that the company is backed by the most important financial house in the world. I contend that there is no more chance for loss in buying these preferred 7 per cent. at par than in buying standard U. S. silver dollars at the same rate, and that there is a large opportunity for a grand profit. The New York city government has closed the contract with the local lighting companies at a general price of 40 cents per lamp, which with the underground ghoul haunting their every action keeps their noses very close to the grindstone. I have not heard of a sale of stock in any of the companies since the poles began to fall for anything near par. The local Edison companies are the exception. The bonds and shares are high and have very few fluctuations, these usually an advance. The telephone holds its own in price and closes at 209. This year will solve that problem. Judging from the British efforts the opposition to the Bell will not be of any great aid to the public. The Western Union, the father of all securities, has declared the regular quarterly dividend. George Gould has stepped officially into his father's shoes, and the business will be practically unchanged; therefore the year opens with the telegraph consolidated, also the telephone; now if the General and Westinghouse follow suit we shall know where to look for headquarters. It is estimated that $750,000,000 are now invested in electric industries in the United States, $350,000,000 of which is in light and power, and outside of this there are $100,000,000 invested in electrical supplies and manufactures. I think fully 25 per cent. will be added to electric investments this year, and my pen and experience will, without egotism, be of sound service to the investors.

A NEW BLUESTONE BATTERY.

This battery has passed the experimental stage and is now an assured fact. Two cells have run a No. 3 Premier motor over 500 hours, including a 200-hour steady run, operating four and six blade fans. The motors used do not have to be specially wound, neither are resistance coils, nor short-circuiting devices necessary when the motor is not required. The cost of running the No. 3 Premier motor with three cells of this battery is less than one-half cent per hour of work. The chemicals used are easily procured and are not dangerous to handle, and to insure satisfaction the cells are shipped complete with chemically pure bluestone. This battery has been seen in full operation, and it certainly deserves the popularity it has already attained. Patents have been applied for, and it is manufactured solely by M. R. Rodigues, 17 and 19 Whipple street, Brooklyn, N. Y.

THE H. N. H. ELECTRIC CO.

The H. N. H. Electric Co., 136 Liberty street, New York, represented by A. Hamerschlag, M. Norden and N. Harrison, has recently completed several large contracts, among them the lighting of the Hebrew Technical Institute. Due to the alertness of these gentlemen they have secured a large export trade and have fully equipped many large Cuban plantations with electrical apparatus. Mr. Hamerschlag has had a varied experience in and about the largest sugar plantations of Cuba, having installed in them entire lighting systems and remedied many existing faults. M. Norden, formerly a contractor, has invested his interests in the company, and is perfectly acquainted with all the details of wiring and installing of complete plants for both power and lighting. The other partner, N. Harrison, has grappled with all branches of electrical engineering, being a graduate of the electrical engineering course of the School of Mines, Columbia College. As can be seen, they stand ready as engineers to cope with any problem that may arise, and fully represent that earnest, energetic spirit so necessary to success in active life.

"QUEEN & COMPANY, INCORPORATED."

Among recent business changes of special interest to the electrical fraternity is the transferring of the business of James W. Queen & Co., Philadelphia, to a stock corporation bearing the title Queen & Co., Incorporated.

The new company starts with a paid-up capital of $600,000, which will be increased from time to time as may be required for the extension of its numerous interests, which in addition to electrical measuring instruments comprise scientific apparatus of every description.

The incorporators and directors for 1893 are: S. L. Fox, E. B. Fox, J. G. Gray, W. Biddle, Jr., J. G. Biddle and F. W. Stanwood, all of whom have been actively connected with the old firm.

E. G. Willyoung continues as superintendent of the electrical laboratory.

TRADE NOTES.

THE ELECTRIC RAILWAY ENGINEERING COMPANY, 180 Summit Street, Boston, has been reorganized and will hereafter be known as the New England Engineering Company, with same address. The company has secured a corps of competent engineers and is prepared to do general engineering for the designing and construction of power plants for electric railways, electric lighting and other electric stations; also steam plants and water-powers. Electric-railway construction is made a specialty.

THE SCRANTON TRACTION CO., of Scranton, Pa., has placed the contract for the building of its new plant with the Berlin Iron Bridge Co., of East Berlin, Conn. The boiler and engine room will be 65 ft. wide by 200 ft. long, with a machine-shop and car-shed 93 ft. wide by 225 ft. long. The entire plant will be fire-proof, of the well-known Berlin construction.

The Electrical Age's Illustrated Record of Patents.

Issued January 3, 1893.

488,978. Brush-Holder for Dynamos and Electric Motors. Ralph Ashley, Philadelphia, Pa., assignor, by mesne assignments, to the United Columbian Electric Company, of New Jersey. Filed Feb. 18, 1892.

488,993. Telephone-Switch. John C. Francis, New York, N. Y., assignor to the Echo Telephone Company, same place. Filed Feb. 15, 1892.

489,000. Commutator for Dynamos and Electric Motors. Henry Groswith and Ralph Ashley, Philadelphia, Pa., assignors, by mesne assignments, to the United Columbian Electric Company, of New Jersey. Filed Feb. 18, 1892.

489,005. Elevator-Indicator. Nelson Hiss, Baltimore, Md. Filed March 24, 1892.

489,026. Transmitting Mechanism for Motors and Dynamos. Henry W. Morton, Boston, Mass., assignor to the General Electric Company, of New York. Filed Sept. 1, 1890.

489,046. Electric-Arc Lamp. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Feb. 4, 1892. Renewed Nov. 14, 1892.

489,065. Alternating-Current Dynamo. James J. Wood, Fort Wayne, Ind. Filed July 22, 1892.

489,070. Armature for Electric Motors or Dynamos. Cornelius F. Daniels, Macon, Ga. Filed Dec. 2, 1891.

489,071. Field-Magnet for Electric Motors or Dynamos. Cornelius F. Daniels, Macon, Ga. Filed Dec. 2, 1891.

489,075. Thermometric Indicator. Charles R. H. Erkens, Lakewood, N. Y. Filed Sept. 15, 1892.

489,097. Trolley-Wire Support. George H. Scranton and Lorenz Spillman, Columbus, Ohio. Filed May 27, 1892.

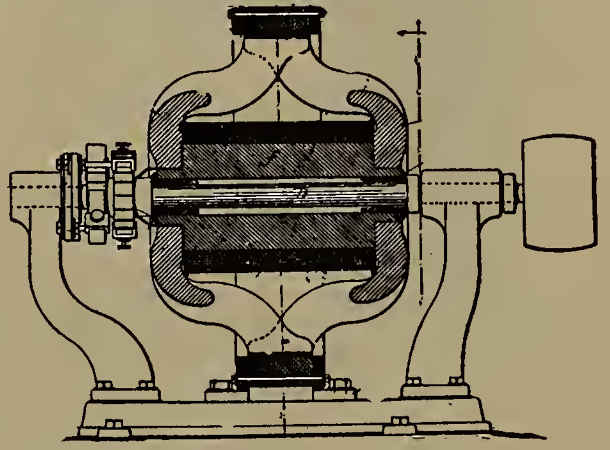
489,099. Testing Apparatus for Multiple Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 19, 1888.

489,100. Test-Circuit for Multiple Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed March 1, 1890.

489,113. Operating Device for Bridge-Gates. Edward Zaremba, Chicago, Ill. Filed March 5, 1892.

489,114. Electric Metal-Working. Craig R. Arnold, Sharon Hill, Pa. Filed May 17, 1892.

489,115. Secondary Battery. Craig R. Arnold, Sharon Hill, Pa. Filed May 21, 1892.



489,065.—ALTERNATING-CURRENT DYNAMOS.

489,150. Electric Lantern. Adam Keil, McKeesport, Pa. Filed May 11, 1891.

489,158. Incandescent-Lamp Socket. George C. H. Foster, Bridgeport, Conn., assignor to the Crown Electric Manufacturing Company, same place. Filed Feb. 8, 1892. Renewed Dec. 5, 1892.

489,161. Electric Meter. Heinrich Illig, Bockenheim, Germany. Filed Jan. 7, 1892.

489,172. Lamp-Support. Curtis N. Wilcox, Brooklyn, N. Y. Filed Jan. 28, 1892.

489,179. Automatic Switch for Trolley-Tracks. William H. Brodie, Brooklyn, N. Y. Filed Aug. 11, 1892.

489,185. Commutator-Brush Holder. Charles F. Goodrich, Chicago, Ill., assignor to John G. Thompson, Milwaukee, Wis. Filed Dec. 29, 1891.

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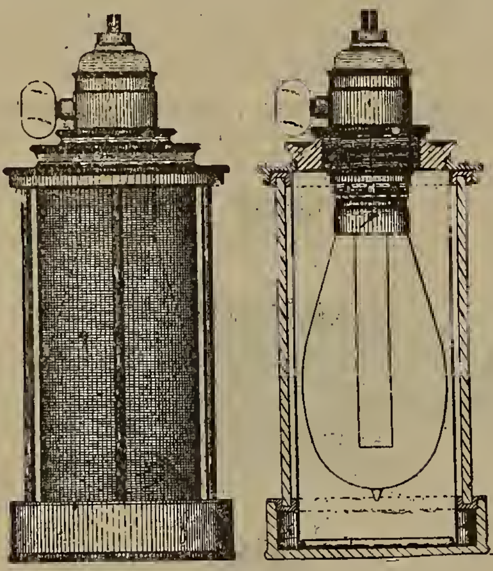
HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician.

PATENTS—Continued.

489,237. Fire-Alarm. William J. Schweiger, New York, N. Y., assignor of one-half to Herman Apfelbaum, same place. Filed July 11, 1892.

489,249. Electrical Measuring-Instrument. Johannes H. F. Görges, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Oct. 27, 1892. Patented in Germany.

489,266. Telephone Switch Appliance. Parnell Rabbidge, Sydney, New South Wales. Filed Jan. 2, 1892.



489,150.—ELECTRIC LANTERN.

489,277. Electro-Magnet. Richard Varley, Jr., Englewood, N. J. Filed June 13, 1892.

489,302. Dynamo-Electric Machine and Motor. Walter T. Goolden and Llewelyn B. Atkinson, London, England. Filed Aug. 18, 1891. Patented in England.

489,312. Fire or Burglar Alarm. Elzear La France, Worcester, Mass. Filed June 7, 1892.

489,315. Secondary-Battery Electrode. Auguste M. Michel, Paris, France, Filed Aug. 24, 1892.

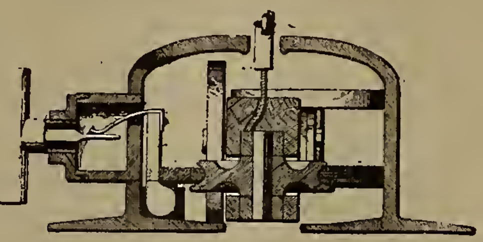
489,316. Manufacture of Accumulator-Plates. Auguste M. Michel, Paris, France. Filed Aug. 24, 1892.

489,318. Electro-Magnetically-Heated Receptacle. Willis Mitchel, Malden, assignor, by mesne assignments, to the American Electric Heating Company, Boston, Mass. Filed March 15, 1892.

489,330. Electric Elevated Railway. Andrew L. Rutter, Washington, D. C. Filed Feb. 20. 1892.

489,364. Combination Fuse-Box. William F. Bossert, Utica, New York, assignor to the Utica Electrical Manufacturing and Supply Company, same place. Filed Dec. 14. 1891.

489,422. Underground Conduit for Electric Railways. Charles P. Tatro, Spokane, Wash. assignor by direct and mesne assignments, of fifty-one one-hundredths to himself, Samuel F. Coons, and Charles M. Patterson, same place. Filed March 28, 1892.



489,422.—UNDERGROUND CONDUIT FOR ELECTRIC RAILWAYS.

489,423. Electric Time Alarm. Jacob P. Tirrel, Boston, assignor to Herbert O. Edgerton, Greenfield, Mass. Filed March 19, 1892.

489,428. Automatic-Time Lighting Device. Antonio B. Y. Dias, Havana, Cuba. Filed July 7, 1892.

489,435. Telegraphy. Zeroy P. Hotchkiss, Oak Park, assignor to the Automatic Telegraph Improvement Company, Chicago, Ill. Filed April 18, 1891. Renewed Nov. 8, 1892.

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THE ST. LOUIS CONVENTION.

Judging from the activity displayed in the electrical trade in the preparations for attendance at the St. Louis convention of the National Electric Light Association, on February 28, March 1 and 2 next, the meeting will be one of extraordinary interest and importance. While there will be no exhibition of supplies under the auspices of the association, Secretary Porter says that supply houses will not be deterred in the least degree from exhibiting goods on their own account, and we learn that many of the New York concerns intend to be largely represented in this way. One of the most important events of the meeting will be the paper of Mr. Nikola Tesla, and we understand that that gentleman will be in attendance himself. The subject of the paper will be of sufficient interest to make it worth the while going 1,000 miles to hear, we are told. The other papers will be of extraordinary interest and value, and, taking it all together, the outlook is very promising for a successful meeting.

END OF THE ELECTRIC CLUB.

Proceedings have been instituted to wind up the affairs of the New York Electric Club, and on Jan. 11 Judge Daly of the Court of Common Pleas appointed Stephen H. Olin a referee to hear, on April 20, at 32 Nassau street, any objections that may be urged against the dissolution.

MUNICIPAL OWNERSHIP OF ELECTRIC LIGHTS.

The question whether or not the municipality should own and operate its electric-light plants is one which seems now to be widely discussed. The right to light the streets of a city naturally and properly belongs to the municipal authorities the same as the right to pave its streets and lay sidewalks. It may be found advisable for a particular community to allow private enterprise to supply the lights, and yet no fault can be found if that community should take the burden upon itself, so far as the right is concerned. The lighting of streets is a public benefit, and in the opinion of many eminent political economists should be under the control and direct supervision of the local municipal authorities.

The great objection to this kind of ownership is that the management would become mixed up with politics, and so be a profitable source for "political barter," and that the general outcome would be robbery, wastefulness and a greater expense to the taxpayers than is entailed by the private enterprise system.

This objection is not without considerable foundation in history. It is based on the presumption that everything will forever remain as it has been. It leaves out of consideration the great fact that the majority of citizens are always respectable, well intentioned, intelligent and capable of managing their own political affairs if once they can be induced to take hold of them.

A community undertaking the operation of its own electric lighting adds just so much to what is known as its "municipal responsibility." It is believed that by increasing this "responsibility" there will be a greater individual interest in municipal management, and so this objection will be obviated.

This of course is theoretically true, but whether it is practical in all or any of our large cities is a question of some doubt. In small places municipal ownership may undoubtedly prove of benefit; but in the larger cities, where the "political ring" holds sway, at present at least serious complications would arise.

ELECTRICITY: ITS APPLICATION IN DENTAL PRACTICE.*

BY ALBERT C. WESTLAKE, D.D.S.

THE application of electricity in dental practice is destined to become popular after its principles are better known by the progressive dental surgeon. As he delves deeper into the mysteries of this subtle power he will be animated with the idea of becoming an electrologist—that is, to be master of electricity in its physical and physiological as well as its diagnostic and therapeutic relations as applied to the exigencies of his practice.

* * * * * * *

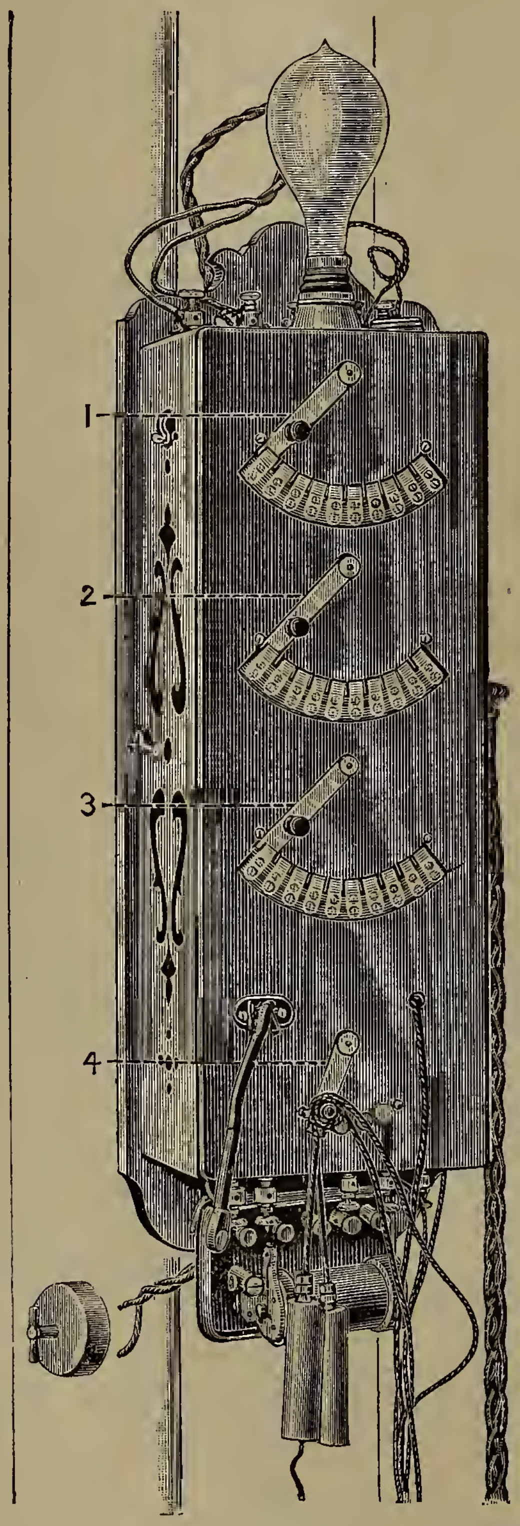
At our present stage of experiments, we assume that it takes twenty times more pressure to overcome the resistance in the tooth than in the soft tissue. The conductivity is also modified by age, temperament and the nature of the disease. Hence greater quantity is used for one advancing in years over a young person and a lymphatic and bilious temperament over a nervous or sanguine. It is quantity that decomposes chemical substances as water, salts, etc., and that accomplishes, by its proper regulation, the therapeutic effects.

Electricity does not by its direct action leave any more electricity in the body than it finds there. If it increases or diminishes the natural electricity of the body, it is indirectly through the effect of the properly regulated current passing through the tissue and improving nutrition. The length of the application is also to be considered; also the differential action of strong, medium or feeble currents.

The difference in the conducting power of electrodes is considerable. A metallic electrode conducts much better than a sponge; flannel conducts better than a sponge, but not as well as a metal. A current that is painful when applied by a metal and quite perceptible when applied by a flannel or chamois-skin is hardly noticeable when applied by a sponge. The painfulness of a current is modified by the extent to which the current is diffused. A large, broad electrode will conduct more than a small, narrow one. The external resistance depends also on the quantity and quality of the liquid used to moisten the electrodes. Warm water adds to its conductivity, and warm salt water best of all. Under firm, close pressure, the conduction is better than with light contact.

In our dental practice the object is necessarily localized electrization, which is accomplished by placing the electrodes so that the current in passing from one to the other shall chiefly traverse the particular part that is to be affected, so far as we can control it. The effect of both the faradic and galvanic currents, however, extends directly or by reflex action to parts beyond the circuit. These currents have often been confused in their physical and physiological effects. They are of course the same force, electricity, only a difference in potential and quantity. For either to be applied successfully, the operator must be competent to diagnose or decide which to use. Thus if merely an intermittently contractile (or stimulative) effect on muscle is desired, the use of rapidly interrupted current at high pressure (such as is obtained from the secondary wire on a faradic coil) is indicated; while if a cataphoric effect is desired, a current of volume is necessary. The operator must also have the current under complete control in both pressure and volume.

In the apparatus here shown, which is devised by my electrician, Mr. George M. Wheeler, of New York, and founded on scientific principles, I use the current for various purposes. Regarding the difference in volume, I may state that as small a current as one milliampère—that is, one-thousandth of one ampère—is led from these posts, while from the two posts, "the cautery terminals," as much as eighty ampères is drawn. The upper switch regulates the amount of current at different pressures given to my cautery electrode. One of the great advantages derived from using the current in this manner is that snares will not burn out from abnormal flow of current caused by shortening of the snare, and one is not obliged to insert resistance to compensate for the reduction in snare resistance, as is found necessary where current is derived from a battery.



CURRENT REGULATOR.

The second switch serves to operate any smaller instruments—such as mouth-illuminator, mallet, hot-air syringe and water-heater. Six different current strengths can be given the mallet by simply sliding the switch-arm. Thus the force of the blow may be varied without putting the instrument out of adjustment.

The third switch varies the speed of the noiseless reversible motor. The treadle connector controls the starting, instantaneous stopping, and the rotating direction of my motor. This switch also varies the current delivered to my faradic coil, and the galvanic current to the terminals on the bottom of the box. The last switch throws in galvanic or faradic currents, singly or combined, to the electrodes as desired.

---

*Abstract of paper read before the Dental Society of the State of New York.

As far as my experiments extend, I find that a very fine or faradic or rapidly interrupted current has more marked effect on the sensory nerves than a coarse or slowly interrupted or galvanic current. This is to be considered in the treatment of local anæsthesia and neuralgia, the mild current having a soothing effect. Again, the negative pole has a much stronger effect both on the sensory and motor nerves than the positive. One can readily distinguish the poles when held in the hand, by the stronger sensation and more violent muscular contraction which is felt at the negative.

I present this subject to the profession as one of vast possibilities. I am convinced that the problem of obtunding sensitive dentine will be solved through the agency of electro-medication or cataphoresis. This theory, as applied to other tissue, was promulgated by the French scientists fully fifteen years ago. My experiments in this line are, at the present writing, not very extensive, but the favorable results obtained encourage the hope that after the differential actions of the two currents on the bone are thoroughly understood, and the decision made as to the drug or drugs to be used, the pain that our patients experience when a cavity is being prepared will be reduced to a minimum. If the positive and negative poles are brought in firm contact on the gum at both sides of the root or tooth to be extracted, the end of these electrodes being in the form of a cup or saucer, within which is placed sponge or cotton saturated with a four or six per cent. solution of cocaine, or absolute alcohol, ether and chloroform combined, or some other properly selected vegetable anæsthetic, and the current turned on gently to the required degree, this preparation can be forced into the tissue sufficiently to cause local anæsthesia. The galvanic current required is from two to thirty milliampères.

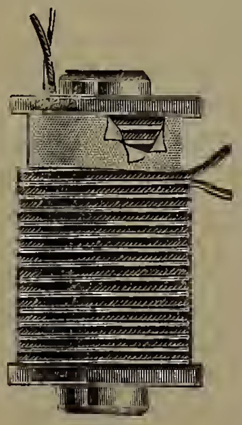


FIG. 1.

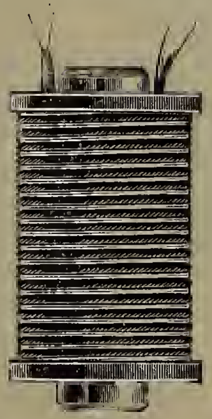


FIG. 2.

IMPROVED ELECTRO-MAGNET.

Of all electrical apparatus ever devised and in use it would seem that the device least susceptible of improvement was the electro-magnet. Electro-magnets differ in form, but they consist essentially of an iron core wrapped with a number of layers of insulated wire.

One of the most important objects sought to be attained in the construction of electro-magnets is to get as much wire as possible in a given space, and it is well known that much valuable space is necessarily taken up by the insulation of the wire. This cannot be entirely avoided, but by a method of magnet construction recently invented by Mr. Richard Varley, Jr., much of the space thus wasted is reclaimed, thereby increasing the efficiency of the magnet.

The method consists in winding on the core, simultaneously, two wires, one insulated and the other bare. The two wires being wound together, it will be understood that every second convolution will be of bare wire and the alternate convolutions insulated, so that the bare wire becomes practically insulated by reason of lying between the insulated wire of the two adjacent convolutions. The practical value of this method lies in the fact that a given number of turns of wire will take up less space on the core than the same amount of insulated wire would; hence a more efficient magnet will be the result. It also means economy in amount of wire necessary to produce a given magnetic effect, as less wire will necessarily be needed to produce the same results as compared with the method now in vogue.

In Fig. 1 we have a view of a "Duplex" magnet nearly completed, showing the alternate windings of the bare and insulated wires, with a piece of the paper between the layers torn out to show the interior construction. Necessarily a magnet so wound will have, when completed, two independent coils of wire, one bare and the other insulated, and four projecting ends, as shown in Fig. 2. The fact that there are four ends, which is due to the method of construction, becomes a very important feature of the magnet, for the reason that it permits of any combination of the two independent coils. For instance they can be joined in series, multiple arc or differentially. Differentially-wound magnets are used on multiplex telegraph instruments, and in this field the new form of magnet will probably find a large use.

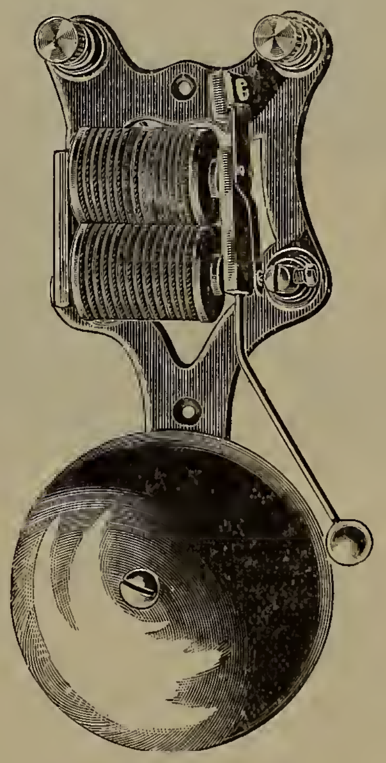


FIG. 3.

Fig. 2 shows a "Duplex" magnet complete, as it comes from the winding machine, with the ends all ready to be joined in whatever combination desired.

Fig. 3 shows an ordinary electric bell fitted with "Duplex" magnets.

It has been practically demonstrated that this system of winding has decided advantages for instruments utilizing low-tension currents, such as call-bells, stock-tickers, telegraph instruments, spark-coils, cut-outs, resistance coils, etc., and there is good reason to believe that it will be equally advantageous in the construction of dynamos and motors, and other high-tension apparatus.

This invention is certainly a decided improvement over the old method of constructing magnets, and the fact that it effects a large saving in the amount of wire used is one too important to be lost sight of.

The winding has to be done by special machinery, which was also invented by Mr. Varley. As it is necessary to wind the two wires simultaneously it cannot be done by hand.

The Varley Duplex Magnet Co., 136 Liberty street, New York, controls the invention.

VEHICLES LIGHTED BY ELECTRICITY.

One of the greatest inconveniences of those travelling at night in street carriages is the darkness of the interior, and almost every means of illumination has been tried without success. Electricity, however, seems to give great promise. A clear, penetrating light is thus obtained for the outside and an agreeable light for the inside. Physicians will greatly appreciate this.

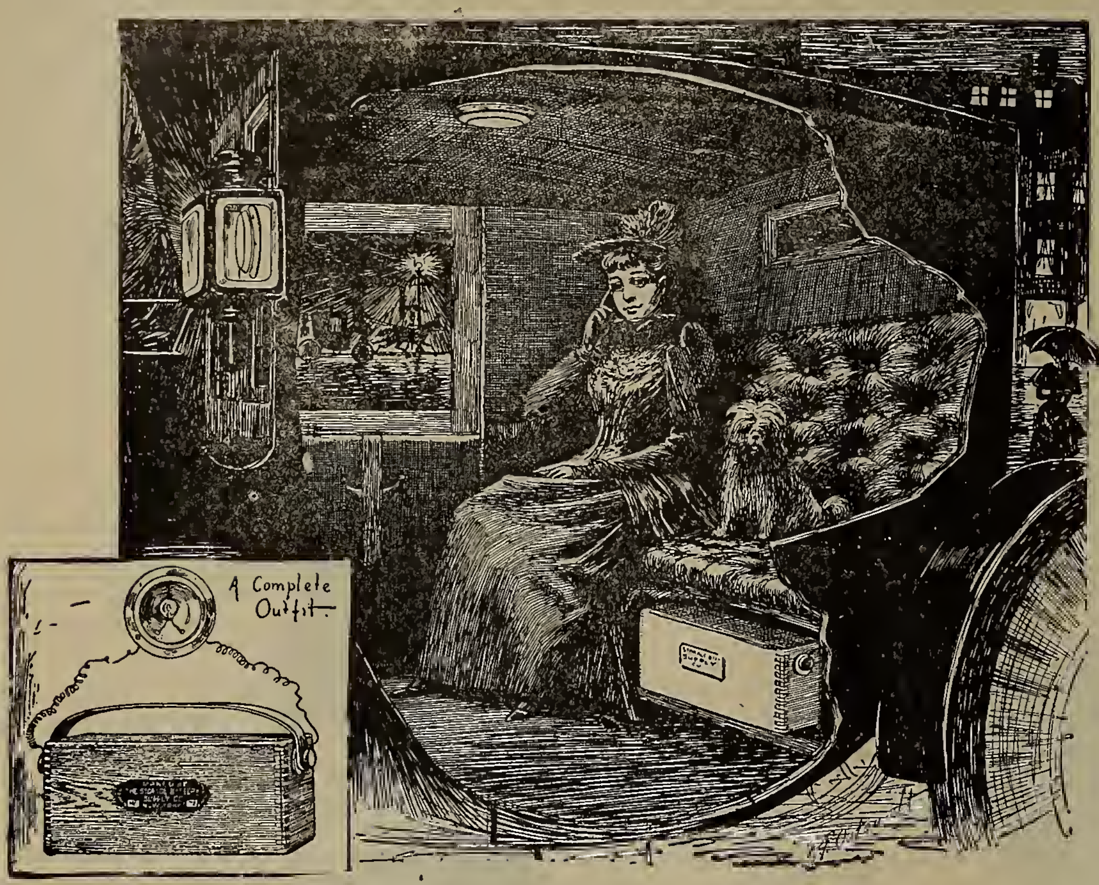


FIG. 1.

An apparatus adapted to this use is manufactured by the Storage Battery Supply Company, of 120 Broadway, New York.

The method of lighting a carriage is shown in Fig. 1. The storage battery is placed under the seat inside, though it may be put under the driver's seat. A small incandescent lamp is affixed to the ceiling, connected with the battery by a small flexible cable, which can be run under the lining of the vehicle covering, if preferred.

The box contains a few storage batteries, each of which will run lamps equal to six candle-power for a period of ten hours. These batteries are connected with the handle-supports at either end of the box, which supports act as terminals for charging and discharging—this being done either by direct electric-light current or by primary batteries. The weight of the entire apparatus is only thirty pounds.

The incandescent lamp used is specially designed and is suspended by springs to insure safety. Back of the lamp is a silver-plated reflector. In front is a bevelled plate-glass mounted in a brass rim, which is screwed on to the reflector, making a safe covering for the lamp. This lamp is not at all in the way of the occupants of the carriage, as it is but 3½ inches in diameter, and projects downward less than three-fourths of an inch. Lamps mounted in a similar way are placed in the outside lanterns. A switch, conveniently located, can be used to light or extinguish the lamps.

A portable electric lantern, shown in Fig. 2, is another useful article made by the same company, and is constructed upon the same general plan as above described.

THE Lloyd-Booth Company, at Youngstown, O., has put in a complete electric-light plant, in order that, when necessary, all departments may be operated at night as well as by day.

REPORT OF THE RAILROAD COMMISSIONERS.

The annual report of the Board of Railroad Commissioners of New York for the year ending June 30, 1892, which was transmitted to the Legislature on January 9 last, makes this reference to the change of motive-power on street railroads:

"A revolution in the method of moving street cars has taken place within a very few years. A street railroad on which horses are used to draw the cars has become almost as much of a rarity as one where the motive-power is mules or oxen. The means of propulsion generally adopted is that of the electrical overhead trolley system. In fact, with the exception of the city of New York, the electric system is universally chosen. This system has found an entrance into the upper part of that city, but, in the main, such roads there as have proposed a change of motive-power, or obtained the consent of the board to such a change, have adopted the cable system. In Brooklyn, the cars of nearly all the lines are still moved by horses, but the consents to a change to the electrical trolley system have been obtained, and preparations for the change are well advanced. In New York the expense of the cable system and the active public sentiment against the use of trolley wires in that city—a sentiment which does not prevail elsewhere—cause the continuance of horses as the moving power."

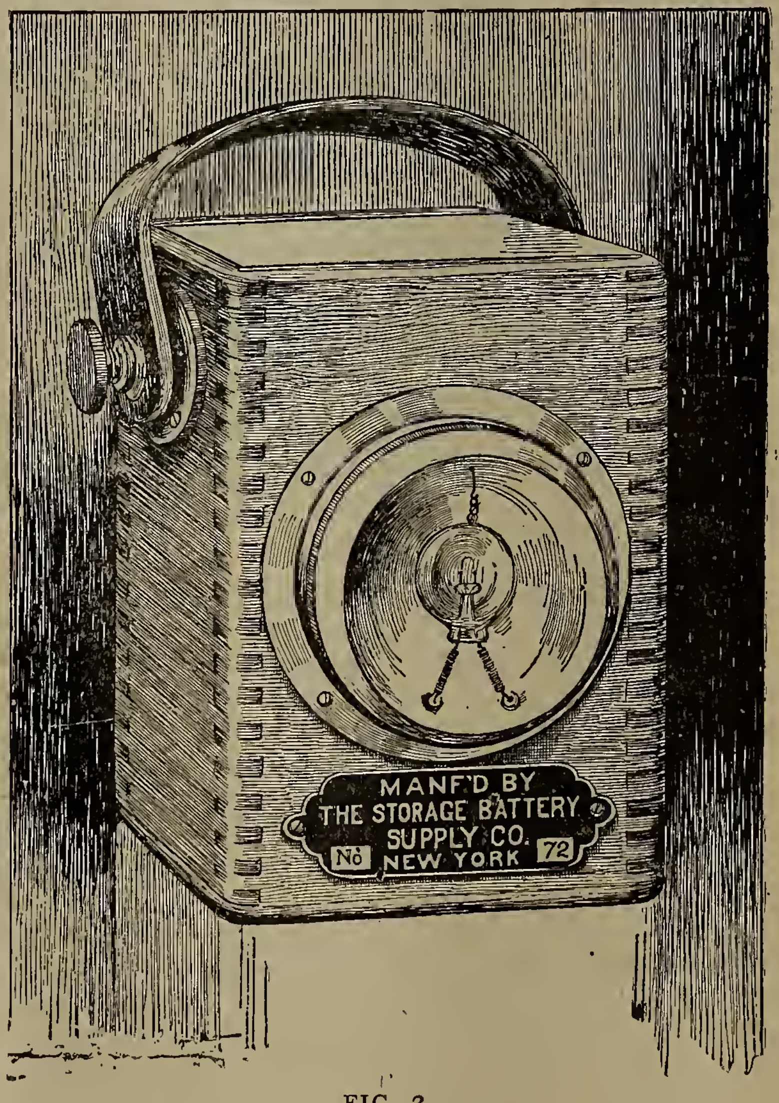


FIG. 2.

THE Negaunee and Ishpeming Street Railway and Electric Light Company, Negaunee, Mich., has decided to bond its property for $40,000.

BIOGRAPHICAL SKETCH.

WALTER P. PHILLIPS.

We doubt if a more perfect living example of the fruits of real American grit, tireless and well-directed energy, keen and far-reaching judgment and all the other qualities that are essential to the make-up of a successful man of affairs, can be found than in the person of the subject of our sketch, Mr. Walter P. Phillips.

Mr. Phillips is not unknown to the electrical fraternity, having in the earlier years of his business career achieved a distinction as an accomplished telegrapher that was then and is now rarely equalled.

In 1868 Mr. Phillips, who was then an operator in Providence, received and copied, without a single break or hitch, 2,731 words in one hour from a fast sender in Boston, and for this remarkable achievement he was presented by Prof. Morse, the inventor of the telegraph, with a beautiful gold pencil and penholder suitably inscribed. The telegraphic profession, however, soon proved to be too narrow in its possibilities for so active a mind as that possessed by Mr. Phillips, and as he was naturally of a literary turn of mind he took up journalism as his profession.

WALTER P. PHILLIPS.

Mr. Phillips was born in Grafton, Mass., June 14, 1846, his ancestors having been prominent in the affairs of the old Bay State for 250 years or more. He attended school and worked on his father's farm until 1859, when the family moved and took up its residence in Providence, R. I. In 1861 Mr. Phillips entered the service of the American Telegraph Company as messenger, and having a quick, active mind soon learned the art of telegraphy in which he became so proficient in later years. When working as an operator in Providence he, in 1870, became interested in journalism. He became managing editor of the Providence *Morning Herald*, which position he held for two years. He was afterwards connected with the *Morning Star* of the same city, and in 1873 he entered the service of the Associated Press in New York city. In this latter field his ability was at once recognized and given the freest scope for practical development. From 1875 to 1878 he held the important position of assistant general manager of the great news bureau, and it was during this period, and mainly through Mr. Phillips' instrumentality that the idea of leasing wires from the telegraph companies by the Associated Press for the handling of its telegraphic service, and to be entirely controlled by it, was given a test. The wisdom and value of the experiment became at once apparent, and from this small beginning—a wire from New York to Philadelphia, Baltimore and Washington—the leased-wire system rapidly expanded, until now the press service requires thousands of miles of wire, which reaches all the principal cities and towns North and South, east of the Rocky Mountains.

In 1882 Mr. Phillips left the service of the Associated Press and in March, 1883, he took charge of The United Press, then an organization of minor importance compared with that of its older and more powerful rival, the Associated Press. Under his able management, however, The United Press soon became a powerful organization, and rendered such excellent service to its patrons that many Associated Press papers began taking its despatches. This was the beginning of the movement which culminated just before the New Year in the absorption of the Associated Press by its young rival, The United Press.

Mr. Phillips is a man of extraordinary executive ability, and resources. He possesses the rare faculty of seeing possibilities in the far distant future, and, having determined upon the accomplishment of a certain result he so shapes his actions and plans in the present as to ultimately end in the realization of his purpose.

There is one side to Mr. Phillips' nature that has been little observed, except by those who know him best, and that is his sympathy with the more unfortunate of his fellow-men. He has a large, warm spot in his heart for old telegraphers, and his most intimate friends know of many cases where he has accomplished a great deal of substantial good among some of the more unfortunate of this class of bread-winners. Generosity occupies a large place in his nature, and he is a stanch friend to his friends.

There are many persons all over the country who have good reason to entertain none but the most grateful feelings toward Mr. Phillips, and these, together with his large circle of friends in the electrical trades and in journalism, will join in congratulating him on his selection as general manager of the consolidated press associations.

SPARE ENGINES.

In electric generating stations it is the custom to maintain reserve dynamos or power generators, but it is not always the case that reserve steam power is provided. The result of this is that when anything happens to the engine, necessitating its stopping, the service is crippled. People who take electric service are more and more depending upon the uninterrupted supply of current, and every producer of current should see to it that every precaution is taken to insure against a failure of the supply. As an instance of the evils of such improvidence the engine of the electric station in Attleboro, Mass., broke down the other day, and, as many factories, etc., depended upon it for power they were of course compelled to lie idle while the engine was being repaired. If a spare engine had been available the delay and the losses it entailed would have been avoided.

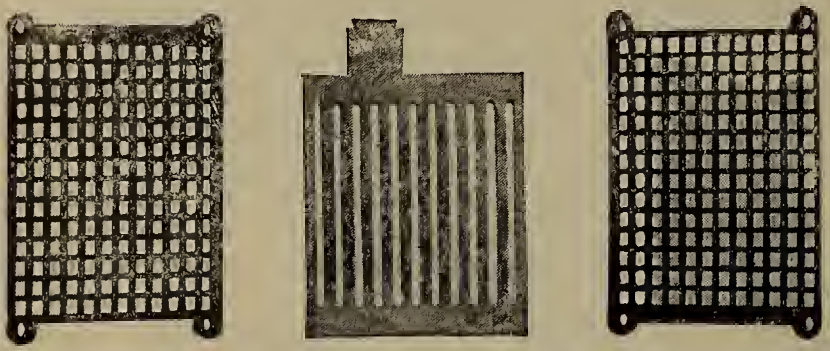
MUNICIPAL CONTROL OF FRANCHISES.

There seems to be a rapid growth of sentiment throughout the country in favor of municipal ownership. of electric-light plants. In Kansas City, Mo., the question is being agitated very vigorously by the press in favor of the idea, as far as that city is concerned, and in many other places and in various States the same subject is receiving popular consideration.

There is a drying-house sor lumber in Ottawa, Can., where electricity is employed as the heating power. This is said to be the first establishment of this character in the world.

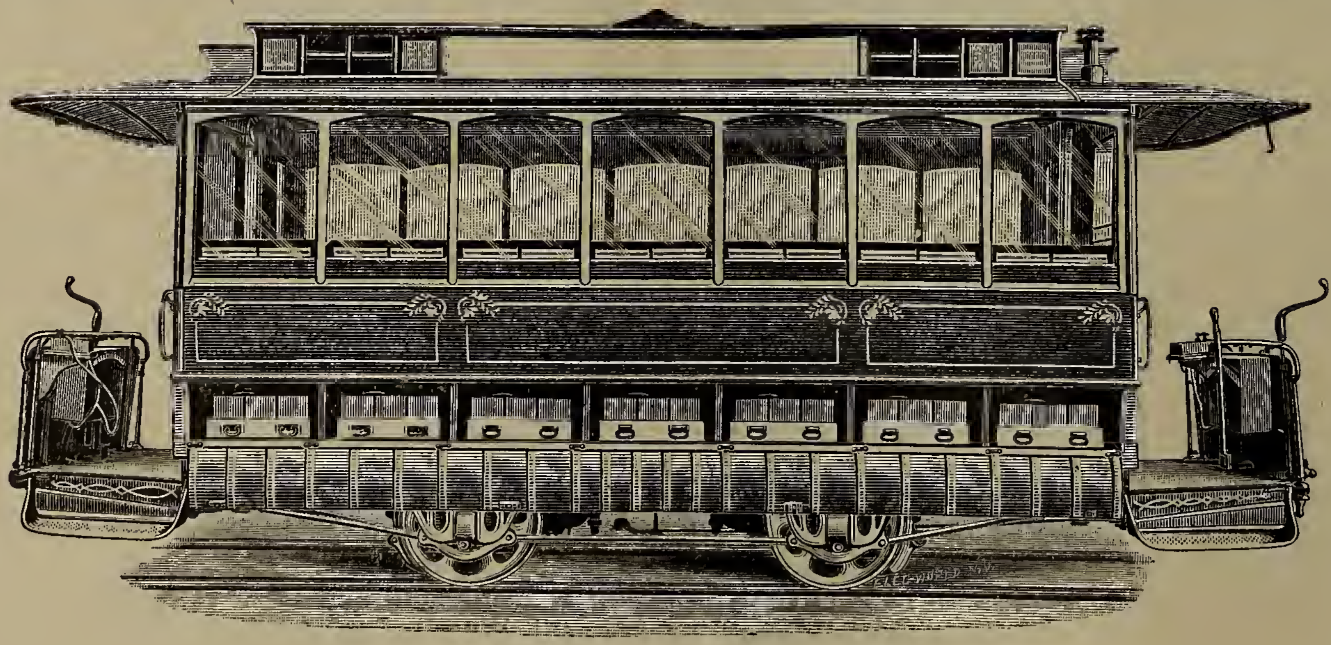
TRIAL OF A STORAGE BATTERY CAR.

A storage battery system of propulsion for street cars which seem, to have attained a high degree of perfection and gives great promise was given a practical test for the benefit of representatives of the electrical and daily press on Wednesday afternoon last, January 11. A car equipped on this new system, containing the press representatives and members of the Acme Storage Battery and Manufacturing Co., of New York City, which controls the system, was run over the Ninth avenue line from the stables on Ninth avenue, between 53d and 54th streets, to 125th street with unquestionable success. Everything worked smoothly, and the grades along the line, one or two of which are quite heavy, were mounted with great ease. In view of the fact that the weather was very frosty and the tracks were in a very slippery condition the heavy grade between 125th and 116th streets was climbed with remarkable ease and smoothness. The test was in every way successful, and if the battery is proved by the test of time to be all that it is claimed for it it would seem that the problem of propelling street cars by storage battery power on a commercial basis is practically solved. We are informed that the batteries on this car have been in use a great part of the time since last October and subjected to the most severe actual tests, and there is not the slightest indication of deterioration of the plates. In fact their construction renders such an occurrence quite impossible.



GRIDS OF ACME STORAGE BATTERY.

The car is equipped with 144 cells of the Acme battery, 72 on each side, and placed under the seats. The cells are contained in 12 boxes, six on each side, each box holding 12 cells. The cells are placed in position from the outside, the sides of the car being so constructed as to give access to the space underneath the seats, as seen in the accompanying illustration.

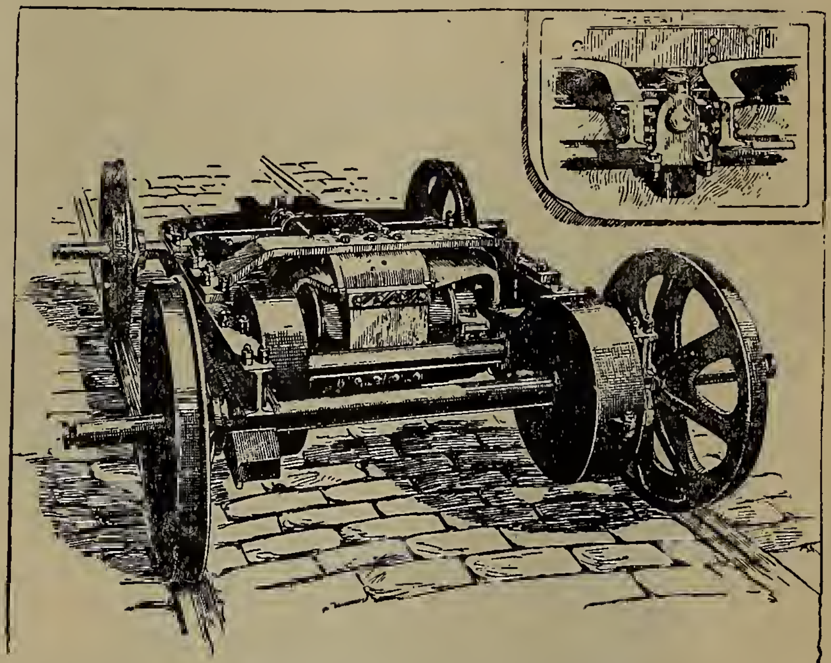


ACME STORAGE-BATTERY CAR.

The Acme cell weighs 27 lbs., against 40 lbs. for a cell of the same dimensions using lead grids.

The grids are of a non-conducting material which is not attacked by the acid and which is sufficiently elastic to yield to the expansion of the active material without buckling, warping or breaking. On the other hand the active material is retained with sufficient firmness in contact with the conducting plate of lead, which is situated in the middle of the complete plate. There is an equal amount of active material on each side of this lead conducting plate, thus insuring an equal distribution of current.

Ribs on the non-conducting grids meet through slots in the conducting plate, and are cemented together, uniting the whole into one solid plate. The openings for the reception of active material are smaller on the outside, to aid in the retention of their contents. The exposed surface of active material is about 40 square inches on each plate, or about 200 square inches for the five positives.



McDOUGALL'S MOTOR ON TRUCK.

The maximum steady discharge on the hill between 116th and 125th streets was 130 ampères, or about 65 ampères per square inch.

One 20 H. P. motor is used on the car. It is the invention of Mr. W. M. McDougall, general manager of the Acme Storage Battery and M'f'g Co., and is of the single magnetic circuit type, with the pole-pieces, yoke and field cores made of mitis iron, and the armature core of laminated sheet iron. The motor is geared to one of the axles, the gearing being well protected by a metal covering.

The car is 16 feet long, of the John Stephenson Co. make, and is equipped with a Baltimore Car Wheel Co. truck.

The Acme Storage Battery and M'f'g Co. was represented by Mr. P. Kennedy, who, jointly with Charles J. Diss, invented the Acme battery; W. M. McDougall, general manager, C. H. Pratt, and Townsend Wolcott, the electrical expert.

ELECTRICAL POLICE AND FIRE ALARM APPARATUS.

Some of the more recent devices put upon the market by the Charles Plumb Electrical Works, 89 Erie street, Buffalo, N.Y., are described and illustrated below.

The Equal Resistance Transposition Fixtures, an illustration of which is shown in Fig. 1, is intended for metallic circuits for telephones, police and fire-alarm systems or any other uses to which metallic circuits are put. These fixtures are intended to overcome induction and the annoyances incident thereto and they can be used on poles running parallel with trolley, electric-lighting or power circuits. This arrangement, or transposition of the wires, under these circumstances has marked beneficial results in the workings of such lines, all induction being overcome. It is a practical method of overcoming the inductive effects of neighboring wires, and these fixtures are giving perfect satisfaction.

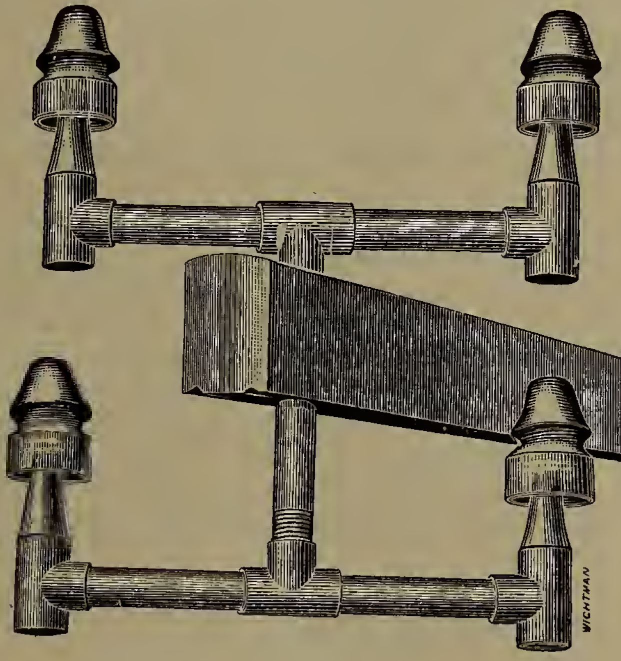


FIG. 1.

Fig. 2 shows a device called "Plumb's Improved Gravity Drop and Cam Movement Set-Back Door-Opening Attachment." It is designed for the use of fire departments, hospitals, veterinary sanitariums, etc., by releasing the bolts upon stall doors and letting the horses out. The bolts are released at the first stroke of the gong and they are held until set back. The device can be made so as to operate any number of bolts, and in different directions, and for either open or closed circuit systems. The best of material is used and skilled workmen are employed in their construction.

Plumb's Automatic Door-Opener for police patrol and fire department engine-houses is shown in Fig. 3. The device is attached to the wall at one side of the doors and the line from the bolts is attached to the rod carrying the pear-shaped weight. The release is operated by either a cord attached to the harness-hanging apparatus or by an electro-magnet—being operated either mechanically or electrically. It is a valuable improvement and gives the most satisfactory results in fire-engine houses where every second of time is of the utmost value.

Fig. 4 shows a pocket galvanometer made by the Plumb Works which has some improvements over the ordinary instrument of this kind.

ELECTRIC CARS AND SNOW.

During the heavy snow-storms in this section last week the electric cars ran with scarcely any deviation from the regular schedule, and the people are well pleased with their performance under the trying circumstances. The Union Electric Railroad in Westchester County performed some very creditable service and in Brooklyn the electrics astonished the citizens with the ease with which they were kept running. The conditions were such that travel on horse-car lines would have been seriously interfered with.

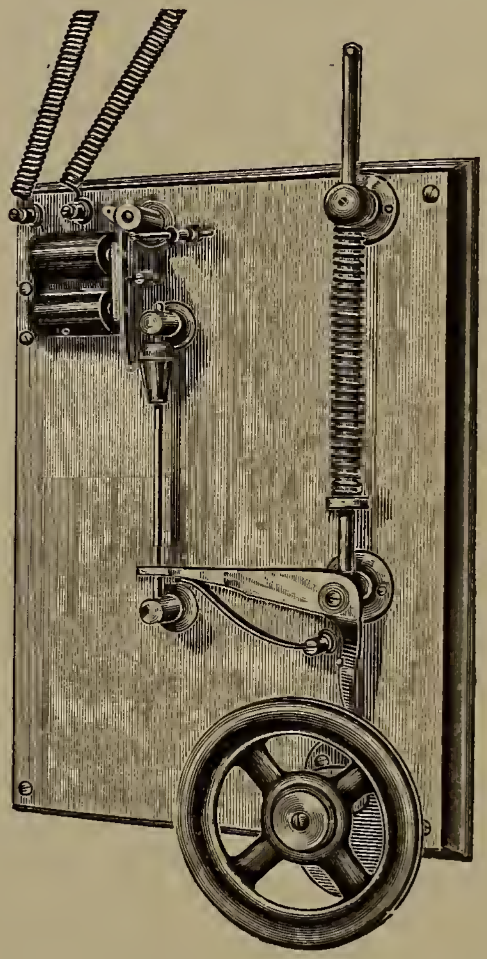


FIG. 2.

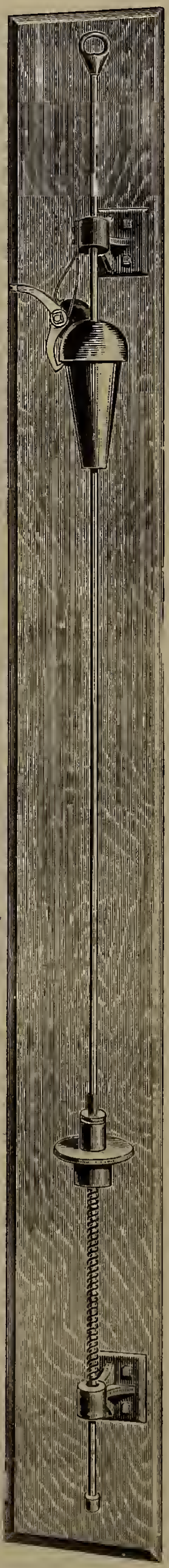


FIG. 3.

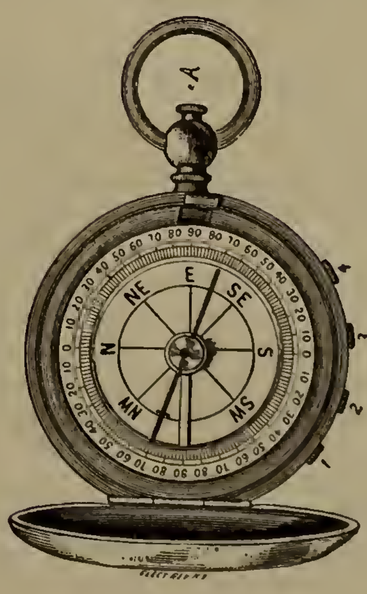


FIG. 4.

ELECTRICAL SOCIETIES.

NEW YORK ELECTRICAL SOCIETY.

A largely attended meeting of the New York Electrical Society at Columbia College on Wednesday night, January 11, listened to the practical and interesting talk on the installation of isolated electric lighting plants given by Mr. Augustus Noll, general superintendent of the New York Electric Equipment Company.

Mr. Noll explained the method of determining the size of unit for dynamos and engines for such a plant, and their location. The construction and connections of switchboards were then explained, then the different systems of wiring were considered at considerable length. The various methods of distribution are the feeder system, feeder and main to central points, and the crib system; and all were clearly explained. General remarks on wiring, location of lamps, switches, etc., were made and the method of wiring, etc., in special installations, such as theatres, breweries, and public institutions, were set forth. Mr. Noll illustrated his remarks by aid of blackboard sketches and plan tracings of actual plants. The lecture was an exceedingly interesting one. Such lectures are of the most practical kind, and if more like them could be assured the New York Electrical Society would meet with a hearty support from the practical men.

NOT UP TO CONTRACT.

The council of the borough of Pottsville, Pa., has recently employed Mr. Carl Hering, the well-known Philadelphia electrician, to make tests of the lights supplied by the Edison Electric Light Company, it having the contract to supply the light in that city. The contract stipulated that the lights were to be 2,000 candle-power, giving a steady light at this standing, and to burn from sunset to dawn. There had been grave doubts as to whether the borough was getting its 2,000 candle-power, accordingly the tests were made. It was found that the lamps averaged only 968 candle-power.

The Edison Company states that in erecting its plant it procured machinery of the required power from reliable sources. It claims, as the council does not accuse them of getting a plant of less power than called for in the contract, that there is no foundation for doubting the good faith of the company.

INTERNATIONAL ELECTRICAL CONGRESS.

The sub-committee on provisional programme for the International Electrical Congress of 1893 of the American Institute of Electrical Engineers has just been given out for publication. It ratifies the adoption of units, terms, symbols and definitions by previous international congresses; defines new units and suggests names for the same; recommends the adoption of an international system of notation and conventional symbols for designating different quantities; defines and suggests the adoption of expressions for alternating currents of more than one phase; for describing phenomena of alternating currents and of electro-magnetic waves, and recommends the more universal use of the terms "voltage," "transformer," "dynamotor," "continuous current," "kilowatt" and the metric system of weights and measures.

A programme for carrying out the work of the congress is also suggested.

THE Chicago, Burlington and Quincy Railroad Co. has closed a contract to equip its through trains with electric lights on the storage-battery system.

FOREIGN NOTES OF INTEREST.

The new steamers of the Cunard Line, the "Campania" and the "Lucania," which when completed will be the largest steamers afloat, will each have an extensive electric-light plant. Messrs. Siemens Bros. & Co. will install the plants. Four sets of generating plant are supplied to each steamer, consisting of Siemens dynamos, coupled direct to Belliss engines, and capable of supplying 1,350 16 C. P. lamps, including 8 large groups of 8 lights each, for cargo working, and a powerful searchlight. The switchboard consists of 13 sections, so arranged as to be capable of connecting up any of the four dynamos installed.

The Marquis of Salisbury will perform the inaugural ceremony at the opening of the Liverpool overhead railway on February 4 next.

FRANCHISE CONFIRMED.

On December 19 last, the council of St. Louis de Mile End, Canada, granted a franchise to A. J. Corriveau of Montreal, for an electric railway and electric-light plant in the municipality. On December 30, an effort was made in council to reconsider the vote granting the franchise, but the opposition was not strong enough and the original resolution was endorsed.

TROLLEY WIRES HINDER FIREMEN.

A large fire occurred in Boston on January 10, and the net-work of trolley lines, feeders, guard-wires, stay wires, etc., which ran along the street caused considerable delay to the firemen's operations. It was necessary to cut all of these wires in order to give the firemen more room to work conveniently. The wires interfered with the work of raising the ladders and the proper direction of the streams of water; and it is said that several firemen received severe shocks from the fallen cut wires. A despatch from Boston states that the insurance people and owners of the burned buildings and those threatened are loud in their denunciation of the trolley system on account of the delay it caused the firemen.

TELEGRAPH DEPARTMENT.

The Postal Telegraph Company has appointed E. J. Nally assistant general superintendent at Chicago; H. J. Kinnucan, assistant superintendent at Detroit, and C. M. Baker, superintendent at Kansas City, Mo.

The Canadian government has forwarded to the imperial government copies of the memorials received from Canadian boards of trade urging the laying of a cable between British Columbia and Australia in the Pacific Ocean. The Canadian government states that it is prepared to further the project. It is estimated that the cost of the cable will be $10,000,000.

Mr. C. P. Brush, well known in electrical circles, has been appointed assistant secretary of the Postal Telegraph Co., New York.

CALENDARS.

The Commercial Cable Company has issued a neat calender with a page for each week in the year. At the end of the pad are given much valuable information and facts for cable patrons.

I. H. Moses, dealer and manufacturer of electrical supplies, 36 South Water street, Cleveland, Ohio, has issued a very neat little monthly calendar, just the right size for hanging up on a desk.

SLIPPERY TRACKS.

Some way of effectually preventing slipping of street-car wheels on the track when the brake is applied is yet to be devised. The cold weather and snowy rails are responsible for many of the collisions and other casualties which occur during the winter season. In Scranton, Pa., recently there was a sort of epidemic of collisions for a few days, chargeable entirely to this cause. The motormen claim that the custom of sprinkling salt on the rails to melt the snow and ice thereon is a good one to that extent, but a bad one in that, when the salt becomes crushed and pulverized, it makes the rails as slippery as before. There seems to be some philosophy in this argument, and it would be well for street-railway managers to think it over a bit. In the meantime can some one not discover a way to prevent the slipping of wheels and thus remove a factor of danger in the operation of street cars, electric cars particularly, in the winter time?

A SUGGESTION.

The citizens of St. Paul, Minn., are complaining because of the insufficiency of the distinctive colors of the lights on the cars of the different street-car lines at night-time. There are so many lines, and the colored lights are consequently so numerous, that different shades of the same color are used in order to go round, and it requires a practised eye to detect the differences of shades. Open signs, with large letters placed so as to be illuminated from the back and visible a block away, are advocated. The motormen delight in making as much racket as possible with the bell; why would it not be a good idea to utilize this propensity to a good purpose? By putting some method into the clanging of the bells those who are color-blind might be able to tell by the taps on the bell when their car approaches. In other words, let any one color be represented by a certian continuation of strokes on the bell, then if a passenger could not tell his car by the color of its light he could by the bell.

A LARGE SYNDICATE.

There seems to be no longer much doubt that all the Brooklyn (N. Y.) surface roads will ultimately be brought under one management. Neither of the two syndicates now buying up the roads is as yet incorporated, and it is claimed that they will combine in one large company, having a capital of about $50,000,000. It is rumored that the name of the new company will be the Brooklyn Traction Company.

NOTES OF GENERAL INTEREST.

The dispute regarding the price for lighting the streets of Providence, R. I., with electricity for another term of years, by the Narragansett Electric Lighting Company, will be decided by a board of arbitration. Gardner C. Sims has been appointed by the city and the Narragansett Company has chosen F. A. Gilbert, president of the Boston Electric Light Company. These two gentlemen are to appoint a third member of the board.

Brockton, Mass., is to own its electric lighting plant.

Dr. Lewis Swift of Warner's Observatory, Rochester, N. Y., claims that the gleams from the electric lights make accurate astronomical observations impossible, and is endeavoring to have the adoption of shades by the electric companies.

The matter of electrically lighting Batavia, N. Y., will be submitted to the people, who will vote on the question at an early date.

A temporary injunction has been issued restraining the Mather Electric Company from selling electric lamps.

For some months there has been a disagreement between the city authorities of Alton, Ill., and the Alton Gas and Electric Light Company, concerning the renewal of the contract for lighting the city another year. On account of complaints of the service the city refused to renew the old contract, whereupon the company presented a new contract at an advanced rate. This also was refused. An eastern syndicate proposes to buy the existing street-car lines, and change the motive-power to electricity, and also light the city.

Hillsdale, Mich., proposes to build an electric-light plant of its own, and issued bond for $15,000 for the purpose. Mr. F. W. Stock, proprietor of the present plant is opposing the project.

The Ft. Wayne Electric Company, Ft. Wayne, Ind., by fire suffered a loss of $250,000 on January 3.

Anderson, Ind., has awarded the contract for the construction of an electric-light plant in that place to the Western Electric Company, of Chicago.

It is proposed to dam Oak Orchard Creek, near Albion, N. Y., to supply power for the generation of electricity. The improvements will cost, it is estimated, about $100,000.

Springfield, Mass., is agitating the question of municipal lighting.

The Westinghouse Electric and Manufacturing Company, of Pittsburg, has notified Comptroller Black of Detroit that it is prepared to furnish the city an electric-light plant with alternating arc lamps for pole and mast-arm lighting. There is a strong sentiment in the city in favor of municipal lighting.

Considerable dissatisfaction has been manifested of late with the service rendered by the New Haven Electric Light Company, New Haven, Conn. A petition to incorporate an independent electric-light company will be presented to the legislature.

The gas commission of New York city has decided to substitute electric lights for gas on Vanderbilt avenue and Fordham to Mott Haven; also to equip Woodlawn Heights with electric lights.

The electric-light companies of Philadelphia, Pa. have been instructed by the city authorities to remove all poles which have been erected for the purpose of city lighting.

The Redlands Electric Light Company, Redlands, Cal., has contracted to furnish the Union Ice Company with 250 horse-power current for the manufacture of ice.

Arrangements have been completed to introduce electric lights in Scottsburg, Ind.

The city council of Springfield, Mass., is considering the matter of municipal lighting.

Electric lights were turned on recently for the first time in Washington, Ind., with successful results, and it is claimed that this is the best-lighted city in the State. Everybody is pleased with the light.

Foster & Brown, of Westbrook, Me., have recently established an isolated plant in their machine-shop, the dynamo being of the make of the Giant Motor Company, Portland, Me.

The Abington and Rockland Electric Light Company, Abington, Mass., will place a 2,000-light dynamo in its station.

Norristown, Pa. — At the annual meeting of the Norristown Electric Light Company the following board of directors was elected: Joseph Shaw, I. H. Brendlinger, James McGinnis, George W. Smith, Samuel S. Kohn, John Slingluff, Isaac W. Smith, Solomon Gilbert, J. Evans Isett and William F. Solly. Officers: Joseph Shaw, president; I. H. Brendlinger, vice-president; William F. Solly, treasurer and B. F. Kerper, secretary.

NEW BOOKS.

How to Make a One-Horse Power Motor or Dynamo. By E. A. Watson. Paper, 50 pages and illustrated. Bubier Publishing Company, Lynn, Mass. Price, 25 cents.

This is a neat little pamphlet giving full directions, for the construction of a practical high-speed motor or dynamo of one horse-power. The illustrations are numerous and the designs are easily understood. The work is intended for the use of amateurs and the author has taken into consideration the limited tool facilities of such persons, reducing the machine work to a minimum. It is claimed that the motor, when constructed, will pump a large organ, run a small machine-shop or printing-office, and drive a 16-ft. boat five or six miles per hour. As a dynamo it will run one 2,000 c.p. or two 1,200 c.p. arc lamps, or ten 16 c.p. incandescent lamps. This book will, no doubt, be of valuable service to those desiring to build a small motor or dynamo.

NEW PUBLICATIONS.

We have received a copy of the first issue of *World's Fair Electrical Engineering*, of Chicago. This is a new monthly magazine and is devoted to the electrical and allied mechanical interests at the World's Columbian Exposition, and is published by the Electrical Engineering Publishing Co., 565 The Rookery, Chicago, Mr. Fred De Land being editor.

The magazine is gotten up in a very convenient size—6 x 9 inches—and the January number is well printed and illustrated. It contains a great deal of valuable and practical information regarding the great fair, also much other matter of general interest. This latest candidate for literary honors will no doubt cover a field of its own, and will probably fill an important mission.

BOOK RECEIVED.

We have received a bound copy of the report of the proceedings of the 14th convention of the National Electric Light Association, which was held in Montreal, Canada, Sept. 7, 8, 9 and 10, 1891.

PEERLESS AUTOMATIC INJECTOR.

The injector is one of the most important pieces of apparatus connected with steam-boilers, and upon its efficiency much depends. An injector that is well known in the trade and for which many points of merit and superiority are claimed by the manufacturers is illustrated herewith. It is known as the Peerless Automatic Injector and is adapted for any service requiring the lifting of water.

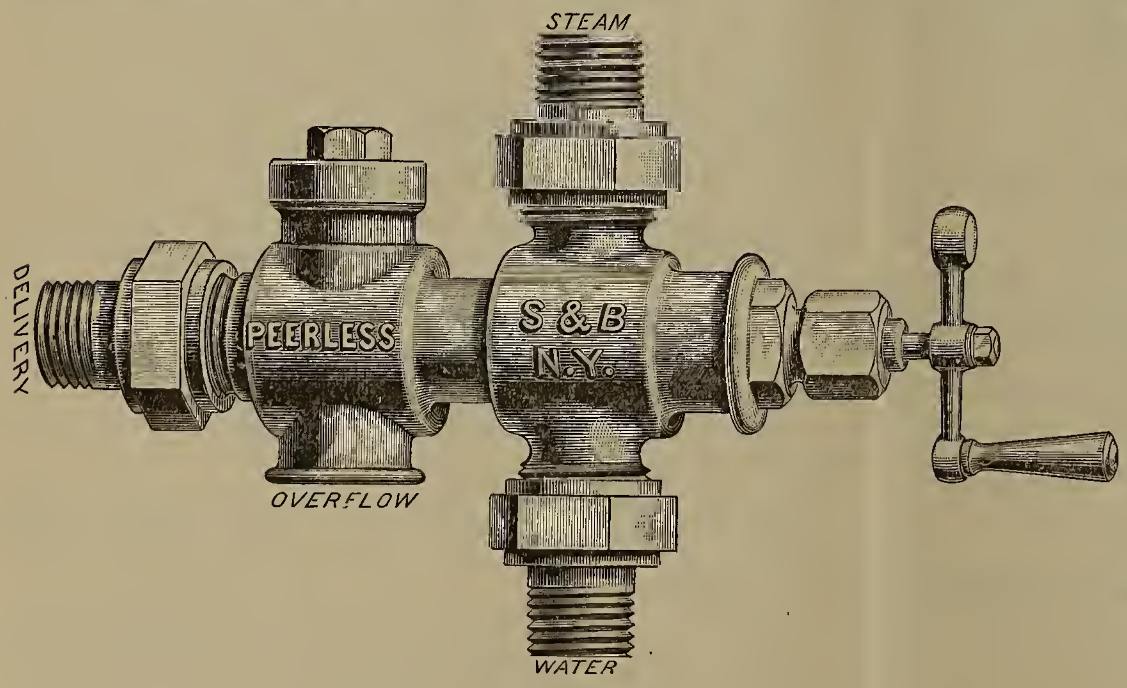


FIG. 1.

Fig. 1 gives a perspective view of the injector and Fig. 2 a longitudinal sectional view showing the internal construction.

These injectors develop a very great force and will deliver water against double the pressure of the steam used to operate it. They are absolutely automatic in their action and in the event of a disturbance of the conditions under which they work they will automatically restart feeding as soon as the proper conditions are restored.

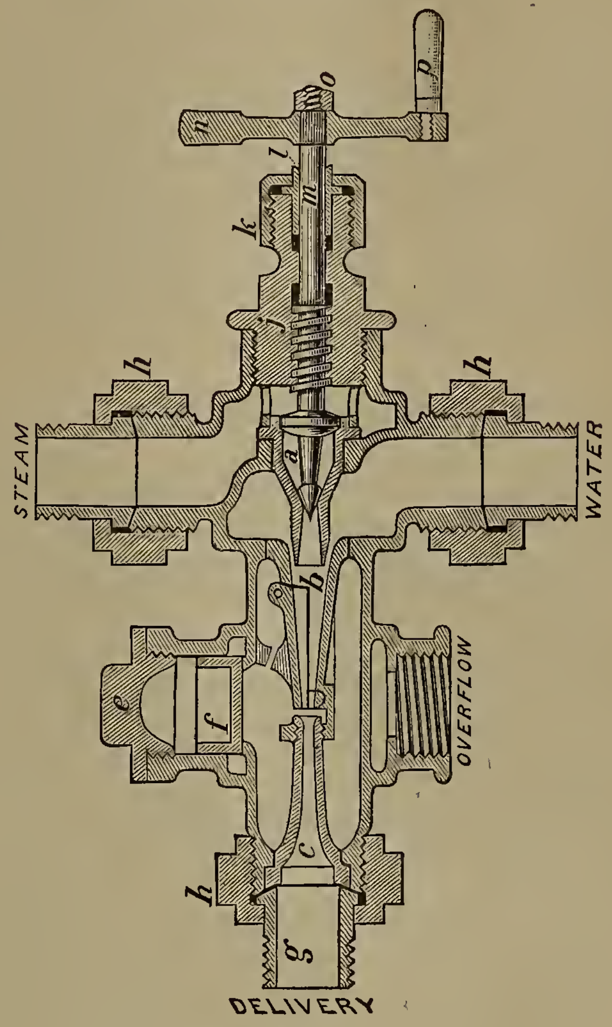


FIG. 2.

These injectors are usually made to lift water from 16 to 18 feet, but if desired they can be arranged to lift 22 feet or more. They work under all pressures of steam, ranging from 20 to 150 lbs. The spindle of this injector acts as a valve for steam inlet, hence an extra valve is not essential, although it is recommended for convenience of detachment.

Schaeffer and Budenberg, of Brooklyn, N. Y., are the manufacturers of these injectors, which are guaranteed to be in every particular exactly as represented. The injectors are made of the best composition steam metal and thoroughly tested before delivery.

Fig. 3 shows the manner of connecting the injector, the pipe connections being clearly indicated. The injector is always placed in a horizontal position and the steam must be taken from the highest part of the boiler. It is simple in construction ; has only one overflow, as in other injectors, no sliding nozzles, no extra side openings and valves which are liable to stick and clog, and it accomplishes its work automatically simply by the opening and closing of its flap-nozzle, which produces instantaneous effect. These injectors are especially adapted for use in situations where from jarring or other causes the conditions are unsteady, and which frequently cause many other injectors to fail in action.

Schaeffer & Budenberg also manufacture a complete line of steam and boiler appliances, including pressure and vacuum gauges, counters, pressure-reducing and regulating valves, etc., etc. Their New York office is at No. 83 John street.

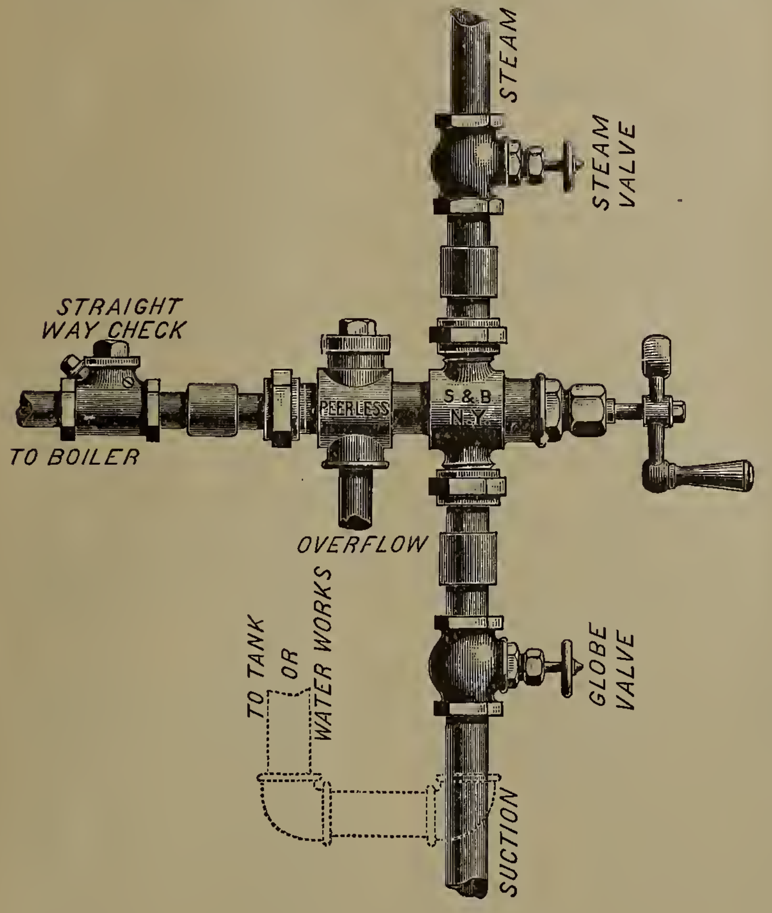
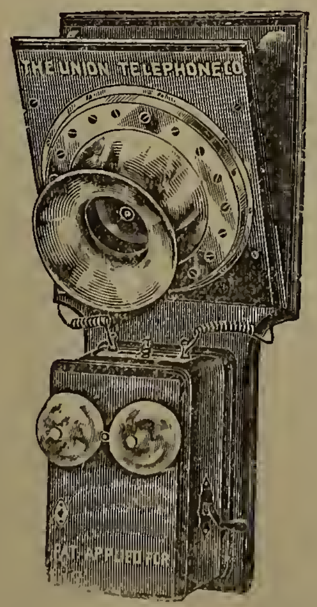


FIG. 3.

THE SIMPSON TELEPHONE.

The want of a reliable short-distance telephone at a reasonable cost has long been felt by the business world. The Simpson Telephone seems in every way to supply this deficiency. It is especially adapted to private lines of two miles or less in length, at all times having a perfect articulation, and its simplicity of construction insures its reliability. Its durability is assured from the absence of electric batteries, and when once put up will last a lifetime. In addition to the fact that the materials used are of the best quality, its durability is further assured because the frame of the mouthpiece and diaphragm are constructed in only two pieces, thereby obtaining a collection and distribution of about 95 per cent. of all the sound waves received by the diaphragm, avoiding the reverberation so frequent in many acoustic telephones.

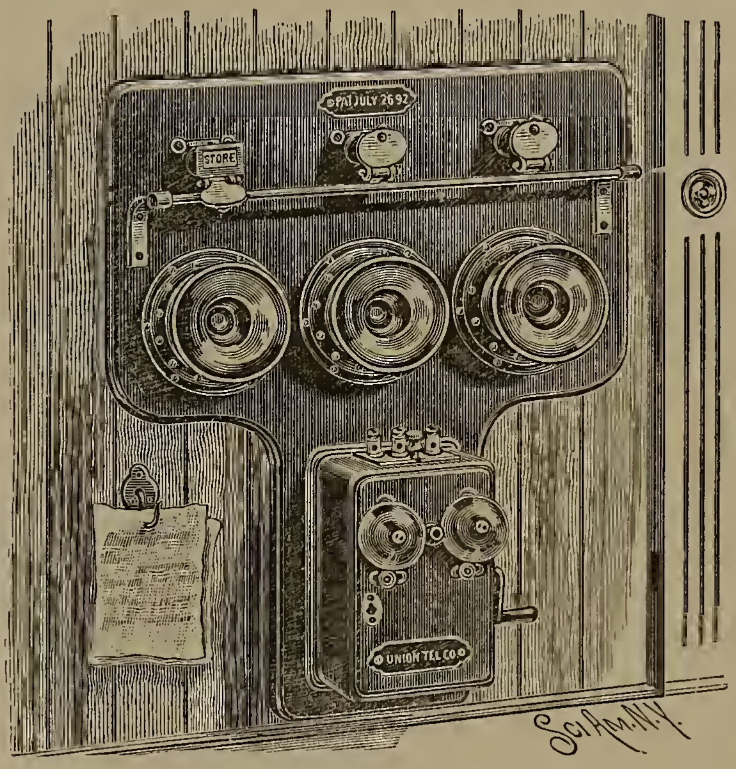


TELEPHONE FOR SINGLE LINE.

There are three styles of these instruments. The first and second are for single lines while the third, the multiple duplex system, is intended for use where several lines are brought together from different points—especially adapted to large factories.

The construction of the lines is very simple, and to those desiring to put up their own instruments, printed instructions are furnished by the company.

These valuable instruments are manufactured by the Union Telephone and Electric Manufacturing Company, of 64–66 Broadway, New York City. This company was awarded the highest medal of superiority for acoustic telephones by the American Institute, New York city. It also contracts for the installation of electric light plants and electrical work of every description, including call systems, annunciators and burglar alarms.



MULTIPLE DUPLEX TELEPHONE.

The company will move into new quarters in a few days.

The officers of the company are A. L. Myers, president; S. L. Simpson, vice-president and treasurer, and A. L. Simpson, general superintendent.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, Jan. 14, 1893.

The annual election of officers by the stockholders of the L. J. Wing & Co. will be held at the office of the company, 243 Washington street, Jersey City, N. J. (office with Collins & Corbin), on Thursday, Jan. 19, 1893, from 2:30 to 3:30 p.m.

Mr. Edwin H. Oswald, of the Benedict & Burnham Manufacturing Company, of 13 Murray Street, New York city, has lately returned from an extended Western trip. He reports large sales of their popular Benedict electric-light and electric-railway feeder wire. This wire, wherever tried, has been the means of duplicate orders. Mr. Oswald says that he is "conveying current" for many electric railroads throughout the United States by means of their well-known hard-drawn copper trolley wire. The company is one of the largest in this branch of trade and believes in maintaining a living price for its goods — giving you just what you order, and better if possible. It also manufactures brass and copper tubing of all sizes and various kinds of brass and copper goods.

W. T. H.

FINANCIAL.

Glowing accounts are flowing in from all directions of the satisfactory condition of the electric business and the profits of the past year. A great many corporations have got their specialties completed, and arrangements perfected to manufacture and supply, that a year ago were in all the throes of distress and despondency. The call for their goods is increasing from the knowledge gained by the trade all over the land and they are constantly adding to the list, out of which they are building up a more extensive business. The work was hard and weary to find capital but there is scarcely an instance of failure all along the line. The great exposition this year will concentrate a multitude of new improvements which are to-day known only to the few who make it their business to keep up with the times by watching the list of patents. This is the field for the moderate investor to keep in touch with ; here is his grand opportunity to help out the poor inventor and get a small supply of the goods on the market and in use. Most inventors know when they can be sold to the best advantage and they are not necessarily kept in doubt over a year. This year will be exceptional in that way in everything electrical. We have simply scratched the surface and find ourselves possessed of light and power, while the application of light may offer but two or three phases ; the details of economy and luxury with its other innumerable chances for intermediate profits must not be overlooked. On the other hand every move towards the utilization of power calls for its own special outlay and consequent income to the producer or investor; whether it be a mine, factory, car, crane, ship or what-not, the rule holds good. As fast as one line, the car-motor for instance, becomes centred under the management of a wealthy and capable corporation which supplies to a great extent the demand, another application comes to the front and calls for the assembly of an entirely different method with its retinue of business. This year will also, no doubt, see considerable municipal electric ownership. It has been proved in a few cases that a city or town by owning its own plant receives better service at less cost than by the present contracts. I note that one of the old, conservative districts of London, St. Pancras, where every detail has been accurately kept account of, tried the experiment last year, and that it proved a glowing financial success. They made a profit of £1,068 over the expenses and saved to the vestry, or town as we should call it, £3,000 in the lighting of the streets, making a clear gain to them, as their books show, of about £4,000. This will continue to be a nice source of income, and every town in America with 10,000 population can make a saving in the same ratio with satisfaction to themselves. The electric stocks and bonds at all the exchanges hold to their December prices, many advancing. Those who bought Edison Illuminating, of New York, a short time ago from 85 to par are holding it firm for 120 and they will get it. The January dividends come along with the regularity of the mail to New York investors in plants in every State in the Union. The supply and construction companies had a most successful year and most of them are full of orders, to be filled as soon as the snow is off the ground. There is so much work to be done that the agitators and strikers don't get time to kick.

ELECTRICAL STOCK QUOTATIONS.

The following are the latest prices for electrical securities in New York, as quoted by Geo. B. Ellery, financial editor ELECTRICAL AGE.

NAMES OF COMPANIES.	CAPITAL.	PAR.	PRICE.
American Dist. Tel., N. Y.	3,825,000	100 00	58 00
American Telegraph and Cable	14,000,000	100 00	87 00
American Visual Telegraph Co.	500,000	100 00	†75 00
Bell Telephone	17,000,000	100 00	205 00
Bell Telephone 7s	2,000,000		*113
Boston Electric Light Co	1,500,000	100 00	117 00
Brooklyn Edison Electric Light	1,500,000	100 00	104 50
Brooklyn Edison Electric Light, 5s	500 000		*100
Brooklyn Citizens' Electric Light	500,000	100 00	155 00
Brooklyn Municipal Light	500,000	10 00	17 00
Brush Elec. Lt. Co. pref., Balto	600,000	100 00	80 00
Brush Elec. Lt. Co., Balto., 5s	200,000		*105
Brush Elec. Ill., N. Y.	1,000,000	100 00	30 00
Brush Elec. Ill., 6s, N. Y.	300,000	100 00	*102
Brush Elec. Co., Parent		50 00	40 00
Brush-Swan E. L. Co. of N. E.	2,000,000	100 00	20 00
Burrell Electric Signal Co., N. Y.	500,000	20 00	10 00
Chattanooga Elec. Lt. Co., Tenn., 6s	200,000		*101
Chattanooga Elec. Lt. Co., Tenn.	100,000	100 00	92 75
Chicago Gas	25,000,000	100 00	89 50
Columbia Chronophone Co., Phila	500,000	25 00	35 00
Commercial Cable Co	7,716,000	100 00	174 50
Cons. Gas Co., N. Y.	35,430,000	100 00	129 75
Cons. Subway Co., N. Y.	3,000,000	100 00	25 00
Detroit Elec. Lt. & P. Co	300,000	25 00	14 00
Detroit Elec. Lt. & P. Co. 6s	300,000		*101
Detroit Electrical Works	1,000,000	10 00	4 50
Direct U. S. Cable Co., Ltd	6,400,000	100 00	50 00
Edison Elec. Ill. 5s, N. Y.	3,050,000		*117
Edison Elec. Ill., Lebanon, Pa	80,000	10 00	13 75
Edison Elec. Illuminating, N. Y.	6,500,000	100 00	119 00
Edison Electric Light Co., Phil	2,000,000	100 00	105 00
Electric Protection Co., N. Y.	100,000	100 00	75 00
Elec. Sup. & Con. Co., N. Y.	120,000	15 00	16 00
Electrical Forging Co	2,000,000	100 00	85 00
Elmira Municip. Imp. Co., 5s	1,800,000		par
Erie Telephone	4,800,000	100 00	50 00
Fort Wayne Elec. Co	4,000,000	25 00	13 00
Franklin Electric Co., N. Y.	5,000,000	100 00	†83 00
Fremont E. L. & P. & Gas Co., O.	95,000	100 00	102 50
General Electric Co.	50,000,000	100 00	111 25
General Electric Co., 5s	7,931,000	10 00	*100
General Electric pref.	4,223,700	100 00	113 00
Great West. Elec. Sup. Co. pref. 8s	350,000	10 00	10 00
Guarantee Identification Co., N. Y.	50,000	50 00	40 00
Hickory Electric Co., N. C.	12,000	100 00	112 00
Interior Conduit & Ins. Co., N. Y.	1,250,000	100 00	75 00
Int. Okonite, Limited	1,700,000	50 00	49 00
Laclede Gas Co	7,500,000	100 00	24 00
Laclede Gas pref.	2,500,000	100 00	70 00
Laclede Gas 5s.	10,000,000		*86
Law Telephone	400,000	100 00	96 00
Livingston E. Lt. Co., Mont., 6s.	30,000		*92
Marshalltown Elec. Co. 6s, Iowa	65,000		*98
Marysville L. & W. Co. 6s, Ohio	60.000		*98
McLeod Railway Equip. Co	3,000,000	25 00	35 00
Metropolitan Elec. Signal Co., N. Y.	1,500,000	100 00	35 00
Metropolitan T. & T., 5s	2,000,000		*103
Metropolitan Traction			138 00
Morristown L. H. & P. 5s, N. J	30,000		*102
Morristown L. H. & P.	50,000	100 00	101 00
Nat'l Elec. Manuf. and Const. Co., N. Y.	50,000	100 00	101 00
N. E. Tel. & Tel. Co	10,394,600	100 00	59 00
N. Y. and N. J. Tel. and Tel. 5s	1,500,000		*98
N. Y. and N. J. Telephone Stock	2,535,000	100 00	98 25
N. Y. Storage Battery	100,000	100 00	96 00
North American Railway Co.	39,767,200	100 00	11 00
Postal Telegraph	10,000,000	100 00	81 00
Peninsular Elec. Lt. & P. Co., Va.	30,000	10 00	9 50
Pettingell Andrews Co., Boston.	200,000	25 00	30 00
Pittsburg Reduct. Co., Aluminum	1,000,000	100 00	105 00
Rockaway Elec. Light	50.000	100 00	40 00
Sawyer-Man Elec. Light Co., N.Y.	125.000	100 00	100 00
Shaver Corporation, N. Y.	100,000	1 00	8 00
Short Elec. Ry. Co., Cleveland, O.	5,000,000	10 00	8 00
Standard Ug'd Cable Co., N. Y.	1,000,000	100 00	80 00
Suffolk Electric Co., Boston	300,000	10 00	10 50
Swan Incandescent	800,000	100 00	6 00
The Gamewell Fire Alarm Tel. Co.	750,000	100 00	100 00
The Hall Signal Co., N. Y.	1,900,000	100 00	100 00
The Hall Signal Co. pref., N. Y.	100.000	100 00	115 00
The Ongley Electric Co., N. Y.	250.000	100 00	85 00
The Siemens & Halske Co., Ill.	500,000	100 00	par
The Washington Wat. Pow., Wash.	1,500,000	100 00	90
The Wells & French Co., Ill.	600,000	100 00	par
T.-H. Electric Co. 5s, N. Y.	500,000	30 00	*101
U. S. Rubber Co.	13,481.000	100 00	44 50
U. S. Rubber Co. pref. 8s.	12,942,500	100 00	98 00
Western Union	100,000,000	100 00	96 50
Westinghouse Elec. & Manf. Co.	7,000.000	50 00	35 00
Westinghouse Elec. Co. pref. 7s.	4,000,000	50 00	50 00
West Point W. Lt. & P. Co., Va.	25,000	100 00	101 00

*Per cent. †Registered stock.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Adams, Mass.—An electric-light plant is one of the possibilities of the near future.

Akron, Ohio.—The Akron Street Railway Company has petitioned the council for permission to build a light and power station.

Augusta, Me.—An effort is being made to light the state prison by electricity.

Bellows Falls, Vt. — The Brandon Electric Light Company will soon increase its facilities.

Ellicottville, N. Y—This place is without street lights, and there is a chance for the introduction of electric lights.

Flatlands, L. I.—The Flatlands Electric Light Company has just received permission of the town board to supply the place with electric lights.

Goshen, N. Y.—The electric-light company proposes to increase its facilities.

Honesdale, Pa.—Messrs. Spettigue, Green and Lyons have been appointed as a committee to arrange for combination gas and electric light fixtures in the town hall.

Hopkinton, Mass., is considering the question of electric lights.

Indianapolis, Ind. — Arrangements are being made by the county commissioners to light the courthouse and new jail by electricity.

Lafayette, Col.—A project is on foot to establish an electric-light plant, and the city council has been asked for a franchise.

Lakeside, Minn.—The village council has passed an ordinance authorizing the Lakeside Light and Power Company to install an electric plant to supply the village with light.

Liberty, N. Y.—Messrs. W. R. Denman and Edward Russell, both of Ellenville, N. Y., have been granted the privilege of establishing an electric-light plant here.

Manchester, N. H.—The mayor of this city in his annual message strongly advocates placing electric wires underground.

Natick, R. I.—It is proposed to introduce electric lights in this village.

Newport, Ind.—It is proposed to soon establish an electric-light plant.

New York, N. Y.—Messrs. J. P. McQuaide, C. Gallagher, and E. S. Perrot have purchased the Norristown (Pa.) and Bridgeport Street Railway. They are open for bids on new equipments in cars, electric systems, trucks, etc. Address room 17, Times Building, New York city.

North Milwaukee, Wis.—The project of constructing an electric-light and power plant is meeting with encouragement by the people of this town.

Quincy, Ill.—The J. B. Schott Saddlery Company is in the market for bids on a 100 to 125 light plant for its factory, to be put in at once. Write them for specifications.

Richmond, Ind. — An electric-light plant is wanted here, and a committee of city officials is now engaged in examining the plants of various cities in the neighborhood. They are willing to expend $40,000 for the purpose.

Saint Paul, Minn.—The Midway Electric Light Company will increase its lighting facilities.

Springfield, O.—The Springfield Light and Power Company will expend $60,000 in extensive improvements next spring.

Whitefield, N. H., is to have electric lights.

Willimantic, Conn.—The Citizens' Gas Light Company has petitioned the legislature for permission to utilize its power in the manufacture of electricity for light and power purposes, and to supply with light and power Norwich, Franklin, Sprague, Scotland and Windham.

Wilmington, N. C. — The Wilmington Street Railway Company proposes to establish an electric-light plant in connection with its power-house.

York Beach, Me.—An electric-light company is being organized, and an electric-light plant will be established here.

NEW CORPORATIONS.

Albany, N. Y.—The Burton Electric Company has been incorporated with a capital of $10,000. Incorporators : Paul G. Burton, Howard Martin and Charles P. Frey.

Boston, Mass.—The Brown Electric Company has been incorporated with a capital of $10,000. Maybin W. Brown, Chas. F. Snedekor and John H. Oxford are officers of the company.

Denver, Col.—The Standard Electric Company. Capital, $15,000, for the purpose of handling Ernest Woltman's "patent electric button." The incorporators are : Ernest Woltman, H. A. Triggs and C. S. Hopper.

Detroit, Mich.—An electric-light company is to be organized here by Joseph Moore and Frank Howard of Ann Arbor ; W. C. Johnson, Waldo Johnson and A. G. Lindsay.

Jonesboro, Ark.—The Jonesboro Power Company has been incorporated with a capital of $7,000 to build electric-light plants.

Lovington, Ill.—The Lovington Electric Light and Power Company has been incorporated with a capital of $5,000. Incorporators : Horace Holdeman, William J. Day, G. M. Stivers and others.

New London, Conn.—The New London Automatic Lighting Company has been incorporated with a capital of $1,000. Incorporators : Almarin T. Hale, Frank B. Brandegee and Frederick S. Gordon, all of New London.

NEW ROADS.

Amesbury, Mass.—The prospects for a street railway between this town and Kingston are very favorable.

Bellows Falls, Vt.—The Bellows Falls-Saxton's River Railroad will be constructed as soon as the legal right to do so can be secured.

Belmar, N. J.—The Asbury Park and Belmar Street Railway Company propose an electric road between Belmar and Asbury Park.

Brattleboro, Vt.—It is proposed to construct and operate an electric railway here. A. H. Barrett is at the head of the project.

Camden, N. J.—It is proposed to construct an electric railway to connect this city with Woodbury.

Canandaigua, N. Y.—An electric railway is projected between this town and Palmyra.

Clinton, Mass.—The North End Street Railway Company has asked for permission to construct a street railway to Boylston and West Boylston.

Coventry, R. I.—Eugene S. Boss, O. H. K. Risley, J. G. Martin and John M. Hall, of this place, have petitioned the Connecticut legislature for a charter to construct and operate an electric railway between this place and Baltic.

Charlton, Mass.—The Worcester, Leicester and Spencer Railway Company is contemplating building a street railroad in this vicinity.

Chester, Pa.—The Chester, Darby and Philadelphia Electric Railway Company is ready to begin work on the line as soon as it has secured the right to enter Chester.

Dayton, O.—A new street car line is to be constructed from here to North Dayton.

Dennison, O.—A franchise has been secured to construct and operate an electric railway from this place to New Philadelphia.

Denver, Col.—The Denver and Westminster Railway Company is to build an electric road from Denver to Westminster and two motor branches north and west from the latter place.

Elizabeth, N. J.—A petition has been received from the directors of the Elizabeth and Plainfield Street Railway Company asking the township committee for location of tracks and permission to lay same to Westfield.

Fall River, Mass.—It is rumored that an electric street railway is to be built from here to New Bedford.

Globeville, Col.—There are prospects of this town having an electric street railway in the near future.

Hammond, Ind.—An electric railway is to be constructed and operated between this place and East Chicago.

Hoboken, N. J.—The Jersey City, Hoboken and Rutherford Electric Railway Company has filed a certificate of incorporation, and will construct and operate an electric railway between here and Rutherford.

Indiana, Pa.—A company has been formed in this town to build an electric railroad to Punxsutawney, a distance of 28 miles.

Lowell, Mass.—It is proposed to construct and operate an electric road between this town and Woburn.

Melrose, Mass.—A meeting of the East Side Association has been held and a committee appointed to confer with managers of different street railways and see what arrangements can be made for the construction and operation of a street railway from Wakefield through this town to Malden.

Mt. Auburn, Mass.—There is a project on foot to construct and operate a street railway between this place and Belmont.

Nevada City, Cal.—A project to construct an electric railroad between this city and Grass Valley is proposed.

New Bedford, Mass.—The Dartmouth and Westport Street Railway Company propose to establish an electric road to run between Dartmouth and Fall River. This is practically the same ground as the project of the Fall River and New Bedford Street Railway Company. Neither company has yet received the franchise.

New Milford, Conn.—There is a prospect of having an electric railroad here in the near future.

North Tonawanda, N. Y.—An electric or cable street railway will be built in this village by the Tonawanda Street Railroad Company.

Pekin, Ill.—A project is under way for the construction and operation of a street railway in this city.

Providence, R. I.—There is talk of constructing an electric railway between this place and Worcester.

Rochester, N. Y.—As soon as the weather will permit the Rochester, Windsor Beach and Irondequoit Railway Company will begin to lay its tracks.

St. Louis, Mo.—It is reported that a street car line will be constructed to Jefferson Barracks by John Scullen.

St. Paul, Minn.—An ordinance has been passed granting the street railway company the right to contruct an electric line on Third street to the Union depot.

Shelton, Conn.—A petition is to be presented to the general assembly by the Shelton Street Railway Company for power to construct and operate a street railway through the towns of Huntington, Trumbull, Stratford and through the city of Bridgeport to connect with the Bridgeport Street Railway.

Shenandoah, Pa.—The Shenandoah-Ashland-Mahanoy Electric Street Railway Company will soon have its lines constructed as far as Ashland.

South Hampton, Mass.—The people of this place are very anxious to have a street railway, and a committee has been appointed to make investigations concerning the same.

Taunton, Mass.—It is probable that another street-railway franchise will be applied for in this vicinity in the near future.

Watertown, Mass.—A petition has been presented by the Newtonville and Watertown Street Railway for permission to build a street railroad operated by electricity.

Westfield, Mass.—The residents of this town are anxious for an electric railroad.

ELECTION OF OFFICERS.

Elizabeth, Pa.—At the annual meeting of the stockholders of the Elizabeth Electric Light, Heat and Power Company, the following directors were elected: T. W. Martin, P. T. B. Shaffer, R. T. Wiley, D. H. Pollock, George F. Duke, William C. McCune and J. P. Patterson.

Gloversville, N. Y.—A meeting of the stockholders of the Johnstown and Gloversville Electric Light and Power Company was recently held and the following directors were elected: James P. Argersinger, R. J. Evans, J. P. Miller, Richard Evans, James I. Younglove, A. J. Nellis, John G. Ferres and J. H. Cross. A. J. Nellis was re-elected president; Richard Evans, treasurer, and J. H. Cross, secretary and superintendent.

STREET RAILWAYS IN CONNECTICUT.

A large number of petitions for charters for street railways have been presented to the Connecticut legislature, and many of the existing street-railway companies will ask for permission from the same source to use electric power.

PERSONAL.

Mr. William B. Turner, late general superintendent of the General Electric Company's works, Schenectady, N. Y., intends to erect works for the manufacture of hangers, couplings, etc. He will probably locate in Schenectady.

NEW YORK STATE NOTES.

Mr. C. H. Thompson, No. 14 Butler Block, South Salina street, Syracuse, N. Y., is a practical electrician of long experience, and he has an excellent reputation for conscientious work. He is contractor and dealer in all kinds of electrical supplies, speaking-tubes, burglar and fire alarms, etc. His specialty is electric gas-lighting, and he also does a large business in building acoustic telephone and individual electric wires.

Mr. Wm. M. Sturgess, superintendent of the Utica Belt Line Electric Railroad Company, is the inventor of a semaphore headlight for electric cars which shows the regular colored lights indicating the route of the car, besides the headlight. An ELECTRICAL AGE representative called on him the other day and found him to be an exceedingly pleasant gentleman. He is in receipt of many congratulations from all parts of the country on his successful invention. A. E. K.

THE MARK RAILWAY EQUIPMENT CO.

The firm of Mark & Sterling, dealers in street-railway equipments, Cleveland, Ohio, was dissolved by mutual consent on January 7 last, and the business is continued by the Mark Railway Equipment Company.

TRADE NOTES.

The Consolidated Electric Manufacturing Company of Boston, Mass., has just issued its pocket catalogue, No. 6. It is a neat schedule of general electric goods.

Through Mr. A. B. Laurence, manager of the Schultz Belting Company of New York, we learn that an order has just been received at the St. Louis headquarters for a Schultz patent Sable rawhide belt, 80 inches wide. This is ordered by a Cleveland, Ohio, concern. It is the largest leather or rawhide belt in the world.

Watson & Stillman, 204 to 210 East 43d street, New York city, manufacturers of hydraulic jacks and presses, punches, rail benders, etc., have just issued a price-list and catalogue of the various styles of hydraulic, screw and lever jacks made by them. These goods are largely used in electric-light, power and railway generating stations.

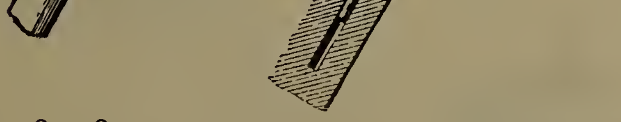
The Goodrich Hard Rubber Co., of Akron, Ohio, has just issued a neatly gotten-up illustrated price-list of its hard rubber electrical supplies, soft rubber tubing, tape, etc. This company's goods stand at the top notch in the estimation of the trade. The quality is the best and always the same, and this is the secret of the large trade the company possesses.

The Electrical Age's Illustrated Record of Patents.

Issued January 10, 1893.

489,464. Electro-Steam-Valve Attachment. James H. Crosby, Somerville, Mass., assignor to the Gamewell Fire Alarm Telegraph Company, New York, N. Y. Filed Sept. 1, 1890.

489,481. Electric-Railway Trolley. Ernest H. Jenkins, Winfield, Md. Filed July 20, 1892.



489,481.—ELECTRIC-RAILWAY TROLLEY.

489,505. Journal-Bearing for Dynamo-Electric Machines. William L. Silvey, Lima, Ohio. Filed May 13, 1889.

489,508. Brace-Chair for Girder-Rails. Max M. Suppes, Johnstown, Pa., assignor to the Johnstown Company, same place. Filed Feb. 20, 1890.

489,522. Galvanic Battery. William C. Cahall, Philadelphia, Pa. Filed Sept. 29, 1891.

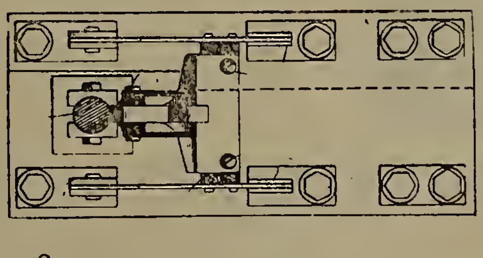
489,526. Electric-Lighting System. Harry M. Doubleday, Pittsburg, Pa. Filed April 21, 1892.

489,551. Electrical Diaphragm. Charles N. Waite, Newton, Mass. Filed March 16, 1892.

489,553. Electrical Switch. George Baehr, Brooklyn, N. Y., assignor to Samuel O'Connor, same place. Filed March 26, 1892.

489,559. Galvanic Battery. George L. Foote, Brooklyn, N. Y. Filed Sept. 13, 1892.

489,563. Electric Railway. Daniel E. Kimball, Topeka, Kansas. Filed Jan. 11, 1892.



489,553.—ELECTRICAL SWITCH.

489,570. Spring-Jack Switch. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Dec. 27, 1880. Renewed Feb. 24, 1890.

489,571. Spring-Jack Switch for Telephone Exchanges. Charles E. Scribner and William R. Patterson, Chicago, Ill., assignors to the Western Electric Company, same place. Filed Jan. 21, 1892.

489,573. Conductor System for Electric Railways. Georg W. von Siemens, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Feb. 3, 1892.

489,597. Multiphase Railway System. Francis B. Badt, Chicago, Ill. Filed Feb. 19, 1892.

489,598. Electric-Lighting System. Francis B. Badt, Chicago, Ill. Filed Oct. 22, 1892.

489,603. Attachment for Telephones. James L. Davidson, Pittsburg, Pa. Filed Oct. 8, 1892.

489,616. Electric Gas-Lighting Apparatus. Aaron M. Sloss, Kansas City, Mo. Filed March 24, 1892.

489,625. Electrically-Controlled Ventilator. Sebastian G. Brinkman, New York, N. Y. Filed March 3, 1892.

489,629. Railway-Signal. William F. Z. Desant, New York, N. Y., assignor to the Desant Electric Company, same place. Filed April 25, 1892.

489,653. Electric Gas-Lighter. Thomas W. Lane, Boston, Mass., assignor to the Electric Gas Lighting Company, Portland Me. Filed Jan. 25, 1892.

489,658. Strain-Insulator. Louis McCarthy, Boston, Mass. Filed June 29, 1892.

489,668. Electric Battery. Clarence H. Bryan, Chicago, Ill. Filed May 3, 1892.

489,674. Loop-Switch. Frederick D. A. Goold, Schenectady, N. Y., assignor to the Edison General Electric Company, New York, N. Y. Filed April 15, 1892.

489,682. Lamp-Socket. Amandus Metzger, Schenectady, N. Y., assignor to the Edison General Electric Company, New York, N. Y. Filed April 26, 1892.

489,687. Means for Controlling Electric Motors. John F. Ott and Arthur E. Kennelly, Orange, N. J., assignors to the Edison General Electric Company, New York, N. Y. Filed May 7, 1891.

489,709. Variable-Speed Electric Motor. Carl Hering, Philadelphia, Pa. Filed April 30, 1892.

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GETTING USED TO IT.

No better example of the reluctance of people to break away from old ideas and habits and adopt new ones has ever been manifested than in the case of the new law requiring the execution of criminals by electricity. This feeling applies to the people *en masse* as well as the individual, and all our readers remember the horror which possessed every one after the first electrical executions were carried out. But now, after the method has become better understood technically, and executions are unattended with any flesh-burning, frothing at the mouth, or any other signs of torture to the victim, the feeling of repulsion has entirely disappeared. It was noticed that the last two electrical executions were reported by the daily papers as ordinary events, and probably their readers thought no more of the circumstances attending them than they do of the most trivial affairs recorded in the daily journals. It is evident, therefore, that the electrical method of executing criminals has passed beyond the experimental stage and is now accepted as a permanency until some better way is devised to accomplish the same result; in other words, people are becoming accustomed to it. It is doubtful, however, if any more sure and painless means of death can be found, unless lightning can be availed of; but lightning is too uncertain and otherwise inconvenient to handle.

HEATING AND COOKING BY ELECTRICITY.

The dream of the housekeeper and electrical enthusiasts has been to see cooking and heating done by electricity. Electricity has been applied to almost everything else, and the people have not been able to understand why houses cannot be heated and cooking done by the same means. Elsewhere in this issue we describe and illustrate some apparatus designed for heating, cooking and performing other work where portable and concentrated heat is required. There is no question as to the many advantages possessed by such applications of an electric current. In cooking, for instance, the heat is turned on at the moment it is wanted and applied just where it is needed, and there is practically no waste; whereas, in the case of a coal fire, much heat is lost in the process of bringing the temperature up to the required degree. With electric heat, however, the full degree of heat is available in a moment, and there is no long waiting for it to cool down as in the case of coal fires. The total absence of all the disagreeable features of coal fires, such as handling coal and ashes, etc., is another great argument in favor of electric heating, and the possible extra cost for current would be more than offset by the satisfaction and enjoyment resulting from its use. In the summer time what could be more convenient than electric heat to cook with? What is there that is as near the ideal method of heating and cooking than such use of the electric current? All of these advantages are now available in any house where an electric-light current enters, or can be put in; but as to the cost of electric current for such purposes we are not advised. Considering its advantages, however, thousands of householders would be glad to pay the extra cost for the luxury in having such heat. On the other hand, central stations, where the current is generated, would derive an immense benefit from an extensive use of current for such purposes. It is a question with most of these stations how to make them pay during the day-time. If electricity should become extensively used for domestic purposes, as indicated above, the problem would at once be solved, as the greatest demand for current for house uses would be made in the day-time.

ELECTRICAL COOKING AND HEATING APPARATUS.

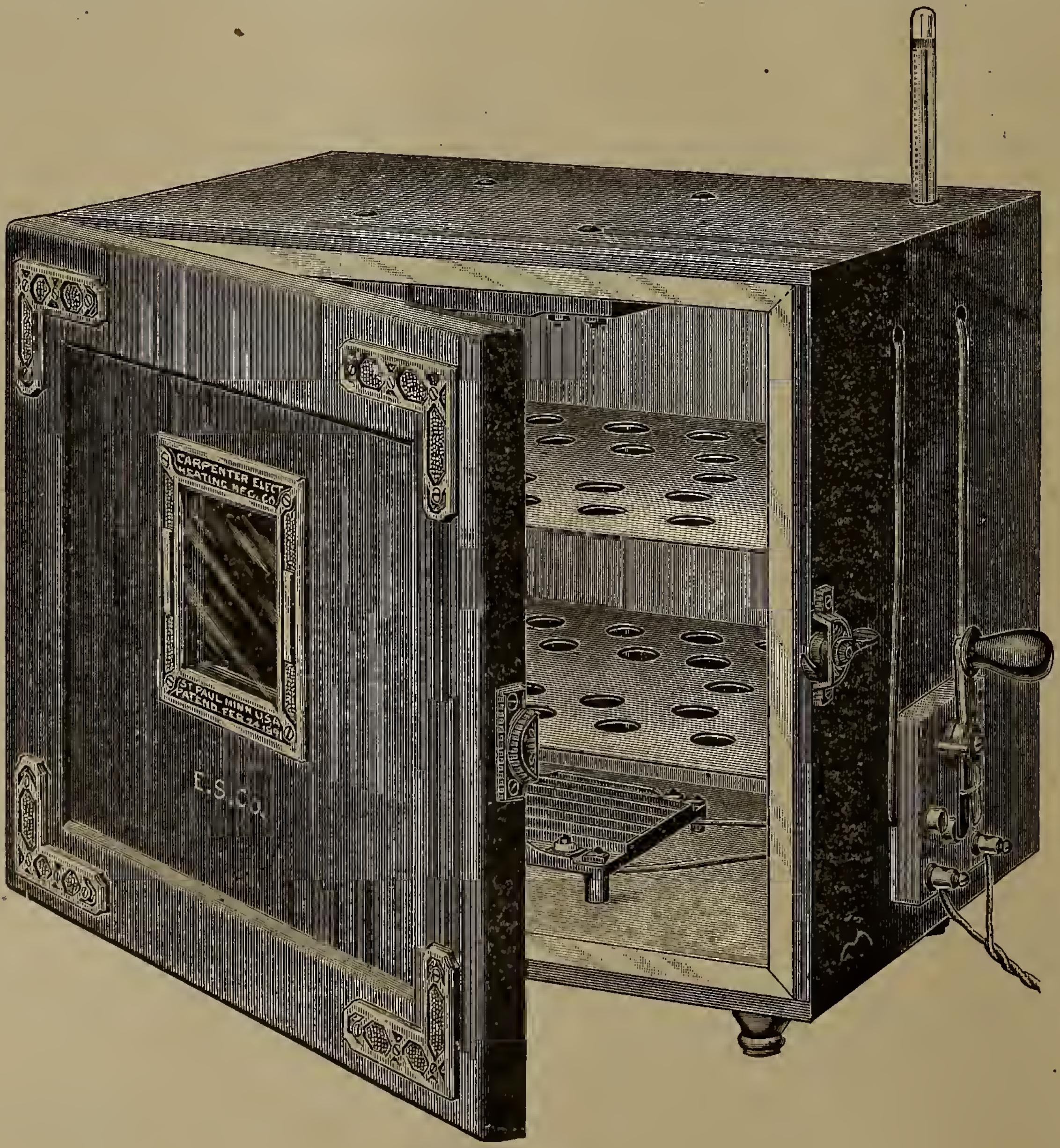
Electricians have known for many years that heat could be obtained from electricity, but how to conduct it safely and economically was the problem, and all this has been solved by the Carpenter process, as the heat is conducted directly to the parts requiring the heat, with no loss by radiation.

ELECTRICAL HAT-IRON.

A factory has been started in St. Paul, Minn., for the manufacture of electric heating devices and cooking utensils, some of which we illustrate herewith.

ELECTRICAL HOUSE AND OFFICE HEATER.

The oven is made of well-seasoned wood, lined with asbestos and the asbestos covered with sheet tin, with two heating plates side by side on the bottom and one on top, and these plates may be heated at will by turning the switch placed on the outside of the oven, so that the operator may have heat on the bottom or top, or both. A glass door is provided and an incandescent light is placed inside of the oven so that the process of baking may be watched. Experience has proven that after hours of baking and roasting the oven can be carried around from place to place with no danger of burning the hands. No basting is required, and the oven door never needs to be opened, and consequently no fumes in the house, which are advantages that will be greatly appreciated by housekeepers. When the switch is turned on the right post the bottom plates become heated, and when on both posts both the top and bottom plates are heated. With the


CARPENTER ELECT. HEATING MFG. CO.
ST. PAUL MINN. U.S.A. PAT'ND. FEB. 24 1891
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ELECTRICAL OVEN.

switch on the left-hand post only, the plate on the top becomes heated. The size of the oven is 18 in. long, 14 in. high 12 in. deep.

In the broilers, griddles, skillets, chafing-dishes, tea-kettles, coffee-pots and the numerous other convenient cooking utensils made by the company there is only one-eighth of an inch of metal between the food being cooked and the heated wire. This is accomplished by completely covering the bottom underneath the utensil with a zig-zag wire and embedding the wire in enamel of such quality as will expand and contract with the heat and cold of the wire without cracking, thus doing away with a stove or range, and the cooking may be done on any ordinary table in any room in the house. Nearly all the cooking utensils are provided with an interchangeable connection left on the table.

ELECTRICAL BROILER AND TOASTER.

The manufacturers are also making electric pressing irons of all kinds, such as sad-irons, goose-irons, polishing-irons, hat-irons, etc. These are kept at uniform heat while ironing by dampness in the clothes carrying off the surplus heat. People who have been using these irons for over a year claim they can iron twice as fast and do away with five or six irons which they formerly used with the old method.

An important apparatus also made by this concern is the house and office radiator, which is illustrated herewith. It is constructed with three separate heating plates placed upright and incased in a nickel-plated frame, provided with an improved spring switch, so that one, two, three or all of the plates may be turned on at the same time by pulling out the knobs at the end of the radiator until they stop. They will remain in this position until pushed in, when the plates will be disconnected, thereby giving perfect control over the temperature. A fuse strip with carrying capacity of 15 ampères on 110 volts, and 30 ampères on 50 volts is inserted.

These radiators are also made for use on 500-volt circuits, constructed with four upright heating plates and connected in series. These can be used on any electric railway current.

The broiler and toaster is ready for use 4 minutes after the current is turned on, and is made for a voltage of 50 and 110, as all the company's other devices are. They are made in 3 sizes, viz.: 7 x 11 inches; 10 x 16 and 15 x 30.

The chafing-dishes will boil one pint of water in 9 minutes and a quart in 12 minutes. They are made of heavy copper, nickel-plated, and have an interchangeable connection which will fit all the other nickel-plated cooking utensils made by the company.

The hat-iron, an illustration of which is shown, is ready for use in 2 minutes, and the heat is constantly maintained. Should it become too hot, all that is necessary is to turn off the current and keep on ironing until the iron cools down, when the current may be again turned on.

The Carpenter Electric Heating Manufacturing Co., of St. Paul, Minn., is the concern which is putting these valuable and convenient devices upon the market, and for them it makes broad claims of economy, durability, quick heating and cleanliness; the disagreeable work of carrying in coal and carrying out ashes is thus completely done away with. Any one of these devices can be used on any continuous-current electric-light circuit, and the heat can be obtained in a moment and applied just where it is wanted.

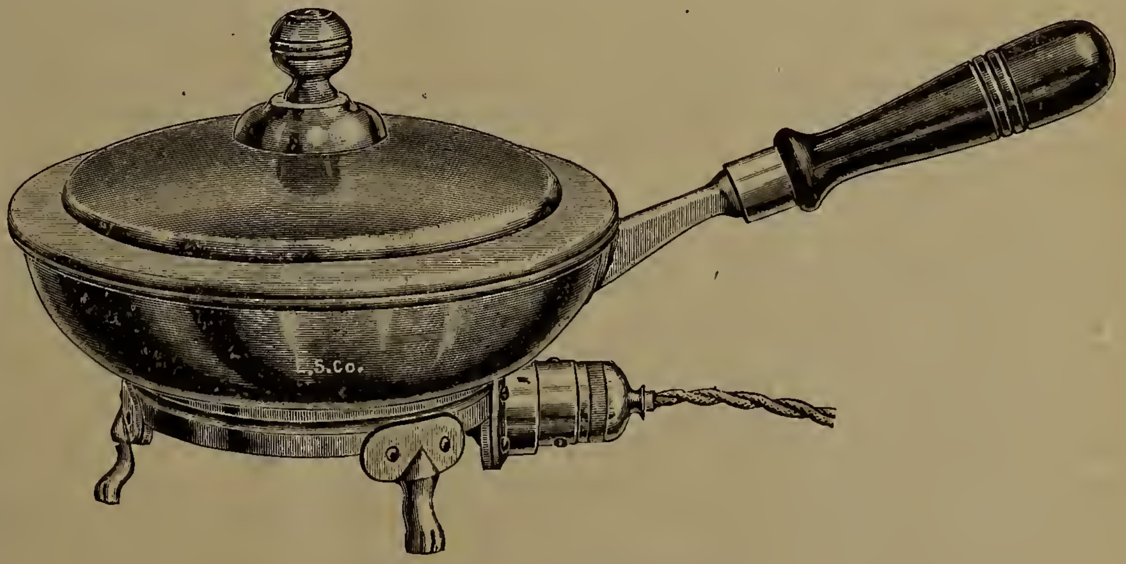
The company now employs over 60 men in the manufacture of its heating and cooking apparatus, and turns out 27 different articles.

SEEKS EXEMPTION FROM IMPORT DUTIES.

Representatives of the Chicago and St. Louis Electric Railroad Company appeared before the Senate committee recently and endeavored to show cause why they should be permitted to import material, free of duty, necessary in the construction of their prodigious undertaking. The General Electric Company, through Eugene H. Lewis, of New York city, opposed this proposition.

Dr. Wellington Adams, the projector of the electric road, said that he had executed a contract for its construction and that he had placed about half of the stock.

He also said that by reason of the hostility to his scheme shown by the General Electric Company, it was doubtful that the necessary machinery could be built in this country in time for the World's Fair.



ELECTRICAL CHAFING-DISH.

On behalf of the General Electric Company Mr. Lewis said that his company could and did manufacture electrical goods as well and as cheaply as any concern in any other country. In support of which he stated that the company was supplying the plant for eighteen electric roads now being constructed in Europe. He also questioned the honesty of purpose of the Chicago and St. Louis Company, which, he asserted, never really intended to build the road. The committee has the bill under consideration.

THE OBJECTIVE REPRESENTATION OF HERTZ'S RESEARCHES ON ELECTRICAL RADIATION.*

BY L. ZEHNDER.

The small sparks which Hertz obtained in the secondary conductor in his experiments on rays of electric force are not immediately suitable for representation to numbers of people, because they emit very little light. It is true that sparks can be obtained about 6m. away from the reflector and about $\frac{1}{8}$mm. long, and these sparks can be seen about 3m. further off in a darkened room, but these can only be seen by a very limited number of people. Many devices have therefore been employed to make the Hertz effect visible. The author has endeavored to attain this object by making the Hertz sparks cause the discharge of a high-pressure set of accumulators through a Geissler tube. The brilliant light of the tube, which continues so long as the primary discharge is continued, is a very impressive method of showing the experiments of electric radiation and reflection. Hertz has himself lately published an account of an experiment in which he has caused the discharge of such a high-pressure battery through a minute air-gap by means of ultra-violet light-rays, a method which has some analogy with the experiments about to be described.

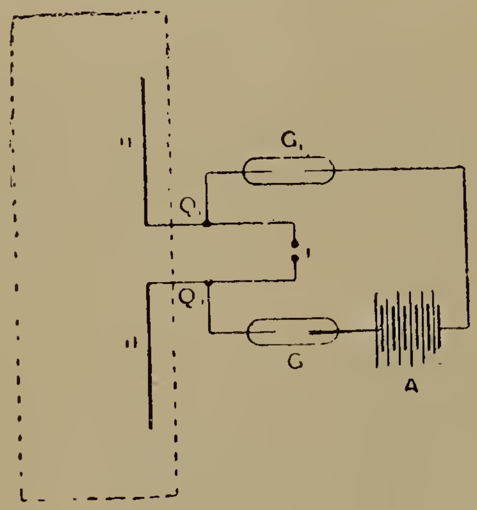


FIG. 1.

The author employed in his researches a reflector with its primary and secondary conductors in the position described by Hertz; the secondary conductor consisted of two brass plates, each of 50cm. long, 5cm. wide, and 1mm. thick. The secondary of the Ruhmkorff coil gave very good sparks of 0.7cm. length when worked with the very rapid Deprez interruptor. The battery consisted of a set of 600 small Planté cells, and was coupled in series with a megohm, so that very small currents passed through the Geissler tube, which could thus be worked for hours together.

The results of a few preliminary experiments may be of interest. The first successful experiment in obtaining effects of the electric oscillations in the secondary conductor on the discharge in a Geissler tube was with the arrangement shown in Fig. 1. II II are the secondary conductors in the focal line of the reflector. Q_1 Q_2 are mercury cups, G_1 G_2 are small Geissler tubes about 4cm. diameter, having their electrodes fairly close together; *f* is the Hertz spark-gap, and A the battery. The spark-gap was so regulated that, when the battery was cut off, small sparks jumped across; then the battery was put on and adjusted to such a potential difference that another cell or two caused sparking through the circuit G_1 f G_2, the potential difference being thus just too little to start the current. If, now, the Hertz spark was started at *f*, the current from the battery immediately broke down the resistance of G_1 and G_2, and the glowing of the tubes showed that the Hertz spark had occurred.

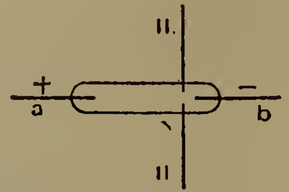


FIG. 2.

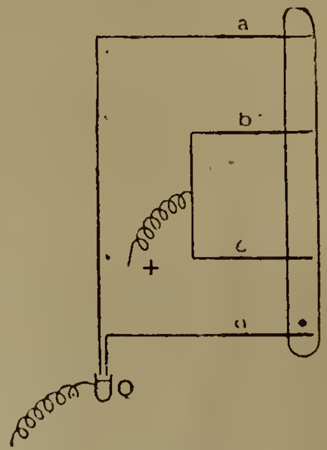


FIG. 3.

The spark-gap was now introduced into the tubes themselves. First, a tube containing a spark gap of definite length was slowly exhausted and the behavior of the spark noted at intervals; the brilliancy of the spark appeared to diminish with the pressure of air. Then the pressure was reduced to 1mm. of mercury; and in order to produce a very small spark-gap, thick platinum-tipped copper wires of about 5cm. length were sealed into the tube and made to touch when hot. On cooling, the copper wires contracted more than the glass, and caused an almost infinitesimal gap between the points, which, of course, increased as the tube cooled. While cooling the secondary, sparks were passed through the gap in the exhausted tube. At first the spark looked just like the ordinary Hertz spark, but, as the wires drew further and further apart, there came a critical point at which the spark disappeared. If, now, the tube was looked at in a darkened room the space in the neighborhood of the electrodes was found to be aglow, the phosphorescence being greatest at the electrodes, and spreading several millimetres on every side. This glow is no doubt the well known kathode light, and it appeared to be very nearly symmetrical with regard to both electrodes. The anode light would probably not be seen, as it was so near as to be masked by the brighter kathode. It was remarkable that the change from spark to glow occurred quite suddenly when the electrodes reached the critical distance apart. The glow could be made between electrodes fur-

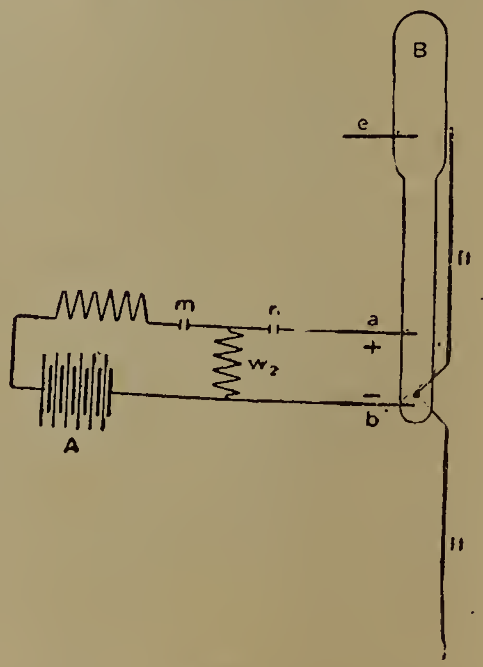


FIG. 4.

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* Abstract from *Wied. Ann.*, No. 9, 1892.

ther and further apart as the Hertz reflectors were put nearer and nearer tegether.

The author then proceeded to seal in the same tube electrodes both for the direct-current discharge and the Hertz spark, as shown in Fig. 2; *a* and *b* are the electrodes, II II the Hertz secondary conductor. The spark-gap was placed near the cathode, since it is known that in the neighborhood of this lies the greatest resistance of the air path; and by breaking this down by means of the Hertz spark the greatest possible diminution of resistance would be obtained. It was found that if, as before, the potential difference between *a* and *b* was adjusted to be just too small to start the current the Hertz spark would cause it to start if the spark was taking place in a gap sufficiently wide to cause it to take the form of the glow described above, but not otherwise. The Geissler tube continued to glow until its circuit was broken. It is, therefore, only the glow discharge of the Hertz secondary which is capable of so diminishing the resistance of the air path in the Geissler tube as to start the battery current.

The next experiment is shown in Fig. 3. Two sets of electrodes, *a b* and *c d*, were sealed into the same tube, *a* and *b* being slightly wider apart than *c d*. Between this latter pair was the spark-gap *f*. By means of a mercury cup, Q, either pair of electrodes could be coupled up to the battery. If *a b* were coupled to the battery, so that a discharge was set up, no current would pass from *c* to *d* if also coupled up; but if, and so long as, Hertz sparks were passing at *f*, the glow took place between *c* and *d*. Thus, by concealing the tube *a b* from sight, the part *c d* would light up whenever a Hertz spark was passing at *f*. The tube gradually became useless, as after a time the resistance of the gap *a b* became less than *c d*.

Many experiments were made with the arrangement shown in Fig. 4. The secondary conductors II II were fastened to the tube B, whose electrodes *a b* served for the accumulator discharge. A is the accumulator, W_1 and W_2 high resistances, *m* and *n* switches. The tube was 0.8cm. diameter inside, and the electrodes were 5cm. apart. The spark-gap was at *f*, near the electrode *b*, which generally served as cathode, and the gap was estimated at 1.50mm. In order to prevent the change of resistance of the tube described in the last paragraph, a certain amount of metallic sodium was passed into the tube by means of the electrode *e*, which absorbed the oxygen remaining in the tube after exhaustion. The pressure was 1.2mm. of mercury. The resistances W_1 and W_2 were tubes containing a solution of cadmium iodide in amyl alcohol, and were adjustable. W_1 in series adjusted the strength of current, W_2 in parallel adjusted the potential difference on the electrodes. By means of this arrangement the passing of the Hertz spark can be shown very well, using reflectors up to 8m. off. The battery discharge, which is started by the Hertz spark, can be seen easily in a room into which no direct sunlight enters, fully 10m. away. By use of the resistances W_1 and W_2 the potential can be so accurately adjusted that the battery discharge both starts and stops with the Hertz discharge.

The author describes some experiments which tend to show that, owing to the variability of the potential difference of an induction coil, it is not equally as well suited for these experiments as a high-potential battery; but he says it may be used when the battery is not available.

Mr. W. A. Green has resigned his position with the Key West (Fla.) Gas and Electric Light Company to accept a position with the Consumers' Electric Light and Street Railway Company, of Tampa, Fla.

John Sewell, manager North Woburn Street Railway Company, has been appointed manager of the East Middlesex and North Woburn Street Railway Company.

ELECTRICAL RECORDING METERS.*

BY CARYL D. HASKINS.

Had we but one standard voltage in use for lighting and for power, and for other purposes, no unit could be better than the ampére-hour for meter measurement; but unfortunately or fortunately, as the case may be, there is scarcely a potential between 5 and 2,000 volts which does not more or less imperatively call for measurement by meter to-day, and if the ampére unit is to be retained, then it will become necsssary to reconcile ourselves to the use of an endless number of constants, or to a still more endless schedule of ampére-hour rates.

We wish to measure power delivered; in fact we wish to know how much coal a group of lamps is consuming. This points directly to the watt, and I venture to assert that careful consideration will invariably show that the watt is the only true unit for the measurement of electricity by meter, unless, perchance, we adopt the cubic foot, as has at least one central station in the United States—a very amusing but equally practical demonstration of American ingenuity.

The earliest successful meters, if we consider classes rather than individual instruments, were the chemical meters, closely followed by thermo-meters.

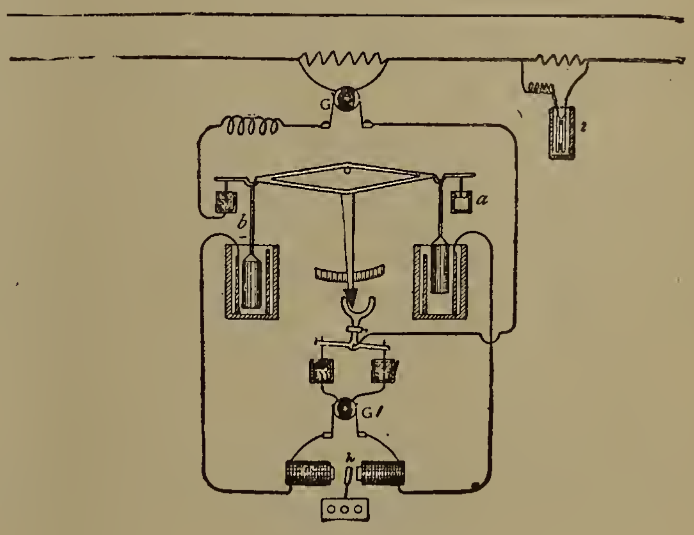

FIG. 1.

The chemical meter is obviously capable of giving most accurate results; in fact, with proper manipulation, it is very doubtful whether any measuring device which has up to to-day been designed could more correctly sum up passing power.

An electro-plating bath in its meter form, as generally used, does not, however, give a dial indication, and the consumers ask for a dial indication almost invariably, unless they have already become thoroughly familiarized with Edison meters as used by many large Edison stations.

Very many ingenious and, some quite successful attempts have been made to actuate a train of gears by the electro-deposition of an electrolytic bath. Thus we have two electrodes suspended at the opposite ends of a walking-beam, as shown in Fig. 1. This walking-beam is in various ways connected with a pole-changer, and, as but a small portion of the current being measured passes through the true meter (for of course almost all chemical meters are shunted), the pole-changer is not perhaps a very serious objection.

The action of such a meter as this is obvious; we have a deposit from one electrode onto the other, until the second electrode becomes the heavier, when the beam tips and the recording device is set one notch ahead; the pole changer is thrown over and the deposit takes place in an opposite direction, the former plus electrode becoming the minus, and so on. This device deposits and reposits the same zinc, or rather electrode material. Again, we have a modification of the same device in the form of a wheel bearing a number of electrodes, and on the same principle setting up continuous rotation.

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*Abstracts from paper read before the American Institute of Electrical Engineers, New York, January 17, 1893.

Another form of self-registering electrolytic meter has a cathode plate suspended from a spring-balance, an ordinary sensitive spring weighing-machine, and the heavier the cathode grows, so much greater is the registration of the spring indicator.

Mercury has at times been employed in the construction of electrolytic meters, and with at least moderate success; for, with a mercury anode and a cathode of the same or other material, a record easily measured may be obtained, and such a meter may even be made self-registering in a graduated tube or by half a dozen other more or less simple means.

Another form of chemical meter formerly quite popular among inventors depended for its registration upon the decomposition of water, generally acidulated water, and sometimes upon the decomposition of more volatile substances. This class of meter may very properly be divided under two heads:

First, those meters simply dependent upon the measurement of the gas developed by the decomposition of water through any gas-registering device. In fact, we may say that such meters are mere decomposing baths connected to a gas-meter. There are some devices of merit which may be classed under this head, but the principle is probably not commercial, for we have nothing very successful of this kind in use to-day.

The second group of meters under this classification brings us to the thermo-meters, a typical group containing a few meters of more or less pronounced merit.

Those thermo-meters, depending upon volatilization of a fluid, generally have two or more sealed bulbs partly filled with some volatile fluid, as for example, naphtha or ether. When two such bulbs are used, they have generally been mounted on a walking-beam mechanism combined with a pole-changer, each bulb containing some kind of a rheostat or heat-developing device dependent for its heat on the current passing through the meter, the two bulbs communicating with one another. The rheostat in but one bulb is in circuit. The heat developed in the rheostat in circuit volatilizes more or less rapidly the fluid contained in this bulb according to the current passing through it. The gas developed either passes in gaseous form into the second bulb and condenses, or else, as is more common, forces the fluid remaining by the simple increase of pressure into bulb No. 2, which at once becomes heavier and causes its end of the beam to fall. This throws the pole-changer, and the rheostat in the second bulb is thrown into action, repeating the operation as just described.

Another ingenious form of thermo-meter, no longer in any sense a chemical meter, is an instrument dependent for its action upon the heat in a confined but circulating atmosphere. Thus a rheostat dependent for its heat upon the amount of current passing is so arranged as to heat a body of air, which, by the peculiar construction of its receptacle, at once commences to circulate more or less rapidly, dependent upon the heat. It is obvious that if a delicate air-fan, a screw propeller in fact, be suspended over such a circulation of air its speed would increase with the speed and volume of circulation, and one of the most ingenious and most interesting meters that it has ever been my good fortune to see is the Forbes meter, constructed on this plan. But here friction is the most serious consideration, the torque obtained in this manner being necessarily small.

Another ingenious and quite positive form of heat meter consists of two metallic rods, or in some cases of two bi-metallic rods, somewhat similar to an ordinary thermostat; such meters being in fact a simple application of the thermostat principle to a recording device. Two rods of this kind may be placed vertically, one under each end of a walking-beam mechanism, the familiar pole-changing device being again brought into play to throw the current first through one rod and then through the other. The character of the walking-beam must be such that only a slight movement is needed to actuate the recording mechanism and also the pole-changer.

* * * * * * *

In conclusion, I would say of the clock-meters that those which actuate a drum or marking mechanism, and those akin to them, generally have a stopping and starting device which prevents the clock from running at times when there is no current passing through the meter; this is quite essential. Those which have a lamp within them for photographically marking the fluctuations of current have an automatic cut-out for the lamp, which turns out the light in the meter when the last lamp on the supplied circuit goes out. I might add that in a few of these meters the clock is displaced by a constant-speed motor.

We may now turn from the consideration of the clock and separate motor-meters, and give our attention to what is to-day the most important class of electrical recording instruments; the motor meters, those whose registering train is actuated by the current to be measured. There are quite a large number of meters of this class, although invention until recently has not been as prolific in this particular direction as in the clock-meter field.

In the majority of cases motor-meters have been designed for alternating circuits, and these again naturally divide themselves into two classes those actuated by inductive principles and those whose motive powers act direct and which are similar in character to the electric motor. Of the first class there is a large number, designed of course for alternating circuits.

These are almost exclusively of two forms—the wound and the unwound armature types. But few, if any, of the former are in practical use, though several have, I believe, shown very fair results. As a rule, they consist of a field formed of a coil or coils in series with the lamps, and a small drum or other closed circuit armature, preferably without iron, whose commutator is short-circuited across by directly connected brushes or other similar means. This meter will record with considerable accuracy, but in the presence of better and simpler plans it has not met with general favor.

The other class of inductive meters is, in its various forms very familiar to almost every one. It consists, in general, of a coil or coils in series with the lamps forming the primary. A short-circuited coil of low resistance within and at angle to this forms the secondary, and within this again is a more or less solid metal armature of disk, drum or other shape, generally, wholly or in part of iron, and mounted on a carefully balanced shaft, which, on rotating, actuates the recording dial.

Meters of this construction, while highly practical and decidedly useful, are scarcely all that could be desired for several reasons, all of which tend to introduce errors. In the first place their construction and principle prohibit entire accuracy on very low readings. This is quite largely due to the fact that nothing is present to balance friction.

Now the theory of meters, as set forth in most of the patents on file, claims a torque proportional to the square of the current, which doubtless would be correct could we neglect the effect of certain minor influences. In reality, careful tests seem to show that torque falls somewhat below the square and above the direct proportion, and the proportion does not seem to hold good at various points of load.

The speed of motor-meters is naturally approximately proportional to the torque, and they therefore tend to run too fast and have to be restrained, which is accomplished in various ways.

None of the inductive meters will run on direct current, of course. We now come to the second form of motor meters—those which are not dependent upon inductive action for their rotation, and are consequently equally serviceable for alternating or direct circuits.

Of these they are but a few, all of them having a field in series with the lamps, and an armature—sometimes in series and sometimes in shunt. Of the former kind but few have been tried carefully enough to thoroughly prove their merits.

The remaining class of motor-meters embraces those with a series field and shunt armature. These are somewhat of a departure from the others, since they are not current-meters but power or watt-meters. Their construction is in all cases quite similar to an ordinary shunt motor, the conditions of field and armature being reversed.

To sum up, then, it would seem that the most practical and useful meter, according to our present light, would be a motor-meter of other than inductive type—preferably an energy rather than a current meter—with some force to balance friction, with a drag which is directly proportional to the speed, and which will be comparatively heavy, making the irregular friction as small a portion of the load as possible.

THE INTERNATIONAL ELECTRICAL CONGRESS.

In our last issue we gave an outline of the report of the sub-committee of the American Institute of Electrical Engineers on provisional programme for the International Electrical Congress of 1893. As the recommendations of the sub-committee are of universal importance and interest we give them in full, as follows:

RECOMMENDATIONS.

Regarding the work to be done, your committee's recommendations are as follows:

RATIFICATIONS.

(1.) Ratification of the adoption of units, terms, symbols and definitions by previous international electrical congresses.

This is a mere matter of form and an act of courtesy to the preceding congresses. Your committee understands that this was done at both the Paris congress of 1889 and the Frankfort congress of 1891. (For the work done at previous congresses see Appendix I.)

NEW UNITS.

(2.) Defining and adopting practical units for measuring and designating the measurements of the following quantities: Magneto-motive force; magnetic flux; magnetic intensity; magnetic reluctance; electric conductivity; illumination.

It will be noticed that this refers only to the question of what the magnitude of the units shall be, or, in other words, what multiples or sub-multiples of the absolute units they are to be.

Your committee is aware that objections are raised by some to the establishment of units not already in universal use. Past experience, however, has shown that the proper time to establish units is *before* their need is universally felt, in order to avoid the introduction by different persons or nations of units of different values, a contingency which will be very likely to arise if not anticipated by concerted action.

Your committee recommends the following:

The value of the practical unit of magneto-motive force to be one-tenth of the absolute unit; that is, equal to $\frac{1}{4}\pi$ ampère turn.

The value of the practical unit of magnetic flux to be 10^8 absolute units or lines.

The value of the practical unit of magnetic intensity to be 10^8 absolute units; that is, 10^8 lines per square centimetre.

The value of the practical unit of reluctance to be 10^{-9} absolute units. (For further explanation of these magnetic units see Appendix II.)*

The value of the practical unit of electrical conductivity to be 10^{-9} absolute units; that is, to the reciprocal of the ohm. This makes it equal to the unit proposed some time ago and known to some extent by the name of "mho." It should be given this value in order that it correspond with the already adopted units.

The value of the practical unit of illumination to be bougie-decimale at the distance of one metre. The bougie-decimale is the unit of light or candle-power already established and is practically equal to one English standard candle; by making the distance a metre, the practical unit will be approximately equal to one-tenth of a carcel-metre, one-tenth of a foot-candle (or "lux") or to one metre-candle or metre-kerze, all three of which units are already in use to some extent.

It has been announced that a proposition will be made at this congress to change the values of some of the practical units which have been adopted by previous congresses and are already in universal use. Among these are the amèpre and the farad. It is urgently recommended by your committee that such changes should not be favored, since they would necessarily be followed by great confusion and would of necessity have to be accompanied by some change in these well-established names in order to distinguish these new units from those now existing.

NAMES FOR UNITS.

(3.) Adopting names for the following practical units: Magneto-motive force; magnetic flux; magnetic intensity; magnetic reluctance; inductance; electrical conductivity; illumination.

The following names are suggested for these units:

For the practical unit of magneto-motive force, the name "gilbert."

For the practical unit for magnetic flux, the name "weber." This term was formerly applied to a unit of current, but its use in this sense was so limited, and it has been abandoned for so long a time, that no confusion would be likely to arise; the context alone would always be sufficient to prevent any possibility of misunderstanding. The name "weber" is preferred on account of the intimate relation between this unit and that of magnetic intensity, for which the name "gauss" is suggested.

For the practical unit of magnetic intensity, the name "gauss." This name has already come into use to such an extent that objections to it will not be likely to arise.

For the practical unit of magnetic reluctance, the name "oersted."

For the practical unit of inductance, the name "henry." This name has already come into use quite extensively, and it would therefore be very undesirable to change it. The value of this unit has already been fixed as equal to 10^9 absolute units, or nearly to the length of an earth's quadrant. The definition "quadrant" is sometimes employed as the name itself, but its use as a name is evidently objectionable, as it already has several other meanings, which might readily lead to confusion.

For the practical unit of electrical conductivity, equal to the reciprocal of the ohm, the name "mho." This name has been in use for some time and is already well known. It is thought better to recommend it than to select and introduce a new name.

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*The appendices referred to in this report will be published hereafter.

For the practical unit of illumination, defined above, the name "bougie-meter."

It has been suggested to name the units "kilowatt-hour" and "ampère-hour." Your committee, however, recommends that inasmuch as these terms explain themselves, and are not longer than some others in use, to give them special names would burden a system of nomenclature unnecessarily. The principal objections to the term "Board-of-Trade Unit," which is in use in England for the former, are, that it could never become international, that it is longer by one syllable than the term "kilowatt-hour," and that there are now, or may soon be, units of other denominations adopted by the same Board of Trade, from which this one will have to be distinguished by an additional affix or prefix.

CONCRETE STANDARDS.

(4.) Defining and adopting modes of embodying the following principal units of measurement in concrete standards capable of being readily reproduced, and adopting names for them or for the theoretical units, by which they can be distinguised from each other: Ampère, ohm, volt, watt, standard candle.

The following definitions of these units are recommended:

An ampère shall be that unvarying current which, when passed through a solution of nitrate of silver in water, in accordance with the specifications recommended in the recent report to the British Board of Trade (See Appendix III), deposists silver at the rate of 0.001118 of a gramme per second.

An ohm shall be the resistance offered by a column of mercury at the temperature of melting ice, 14.4521 grammes in mass, of a constant cross-sectional area, and of a length of 106.3 centimetres. It is recommended that material standards of this value, constructed in solid metal, should be preserved under the care of the several governments as standards of comparison, and that they should from time to time be verified by comparison with the mercury standard defined above; also that for the purpose of replacing the standard, if lost, destroyed, or damaged, and for ordinary use, a limited number of copies should be constructed which should be periodically compared with the standard ohm.

A volt shall be the product of this ampère and this ohm.

A watt shall be the product of the square of this ampère and this ohm.

The other units, such as the coulomb, the farad and the joule, shall be taken as derivatives in terms of this ampère and this ohm.

In order to create as little confusion as possible by the introduction of this set of units, which are to become the universal standards, and in order to distinguish them readily from the true theoretical or abstract units defined in terms of the absolute units, it is recommended to call the former simply "ampères," "ohms," "volts," etc., or, more specifically, "standard ampères," "standard ohms," etc., and to call the theoretical units "true ampères," "true ohms," etc. The latter term has already come into use in this sense.

The unit of resistance known as the B. A. unit shall be taken as equal to 0.9866 of this ohm.

The electro-motive force of a Clark cell at 15° C., prepared in accordance with the specification recommended in the recent report to the British Board of Trade (see Appendix III), shall be taken as not differing from 1.434 of these volts by more than one part in one thousand. The coefficient of temperature shall be taken as . . . . . ?

The standard candle shall be taken as equal to the light from a lamp like that known as the Hefner-Alteneck standard amyl acetate lamp, which is to be defined by its dimensions and the height of the flame, the dimensions being such that the light shall be equal to that of the "bougie-decimale," the practical unit adopted at the Paris congress of 1889, which is equal to one-twentieth of the absolute platinum standard adopted in 1884.

It has also been suggested that a universal wire gauge be defined and adopted. Desirable as this may at first seem, your committee recommends that no action be taken by the congress in this matter, as it is not likely that any one scale would ever be universally adopted by manufacturers, even if defined and adopted by a congress. The universal introduction of the metric system and the designation of wires by their diameters in millimetres is thought to be the only satisfactory solution of this question for international work.

ELECTRICAL SOCIETIES.

CANADIAN ELECTRICAL SOCIETY.

The following is the programme of the convention of this society, to be held at Toronto on January 25 and 26 next: January 25—Paper by Mr. George Black, of Hamilton, on "Electrical Measurements;" paper by Mr. W. A. Tower, Toronto, on "Underground Construction." An invitation is extended to the members of the association to visit and inspect the Toronto Electric Light Company's new station. 8 P.M. — Dinner at McConkey's. January 26—Paper by Mr. J. M. Campbell, of Kingston, on "Free Wiring;" paper by Mr. R. G. Black, of Hamilton, on "The Incandescent Lamp;" paper by Prof. Rosebrugh, School of Practical Science, Toronto, on "Speed Control;" paper by Mr. Breithaupt, of Berlin, Ont., on "Probabilities as to the Success of Distribution of Power at Considerable Distances by High-Tension Currents of Electricity." The members are invited to visit and inspect the Bell Telephone Company's new exchange. The officers of the association are: president, J. J. Wright, manager Toronto Electric Light Co.; first vice-president, K. J. Dunstan, manager Bell Telephone Co., Toronto; second vice-president, John Carroll; secretary and treasurer, Eugene Phillips, Electrical Works, Montreal; secretary and treasurer, C. H. Mortimer. *Electrical News*, Toronto.

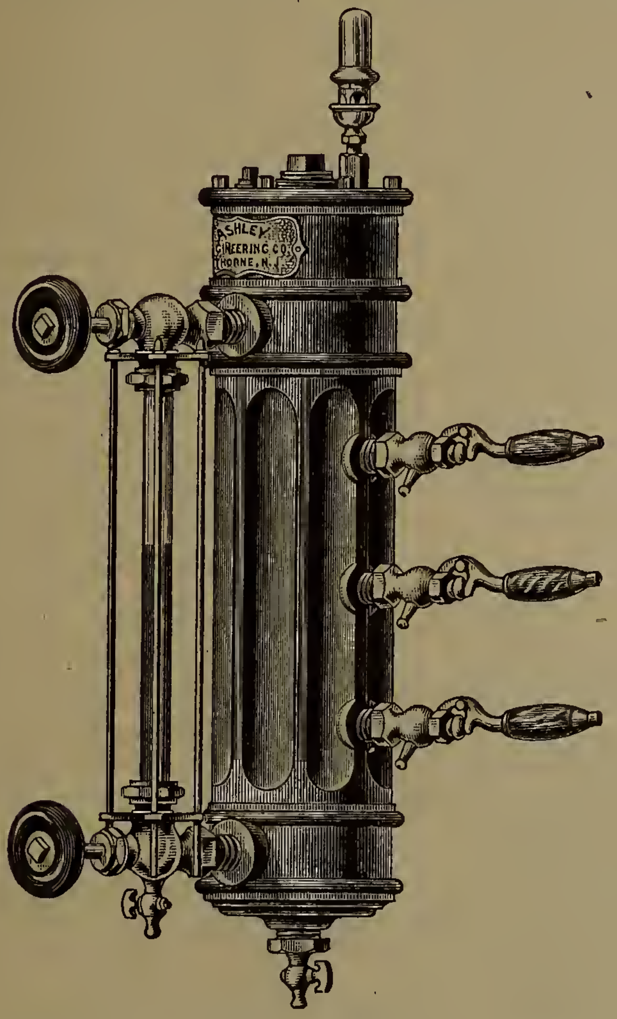
WEST END'S EMERGENCY CORPS.

The West End Railroad Co., of Boston, maintains an "emergency force" for the purpose of rendering aid to the firemen when a fire occurs along the line of the trolley roads. This force cuts the trolley wires and otherwise facilitates the operations of the firemen in case of necessity. Emergency stations are located at several points throughout the city, and in each a force of 3 or 4 men is always on duty, and when a fire occurs they turn out and report to the chief in charge at the scene of operations.

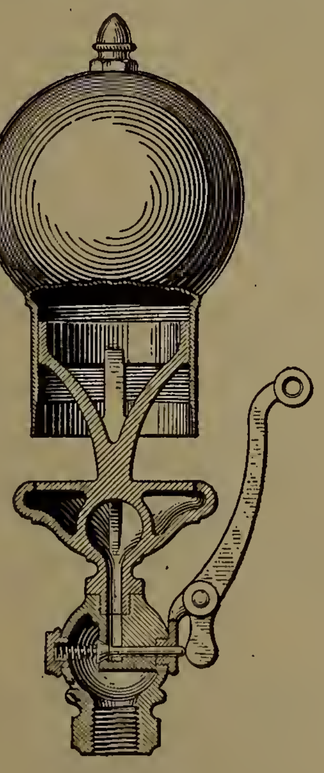
Considerable criticism has been made concerning the tardiness of the emergency force at the recent big fire in Boston, and the West End Company claims that the city has failed to install the fire alarm system in the company's emergency stations, as had been requested, and that there is always danger of delay by not being promptly apprised of fires. The company is anxious to have the fire-alarm system thus introduced, so that its emergency forces will be able to promptly render all the assistance possible to the firemen. The emergency forces are well organized and disciplined, and all they lack to render them as prompt as firemen is the telegraph alarm system.

WATER COLUMN AND ALARM AND BALL-TOP WHISTLE.

Low water is one of the dangerous conditions to be avoided in the use of steam-boilers, as it means either a burned boiler or an explosion. To avoid this danger safety water columns were invented, with the object of giving an alarm when the water gets below a predetermined point.



SAFETY WATER COLUMN AND ALARM.



BALL-TOP WHISTLE.

Ashley's patent safety water column and alarm, illustrated above, is claimed to be one of the best devices of its kind on the market. It is positive in action and never fails to give timely warning when the water in the boiler gets too low. These devices are constructed on correct lines and receive the best attention in manufacture. The whistle valve is made of Tobin bronze and will not corrode or stick, so that the alarm is sure to be given in case of danger. The device is simply constructed and the working parts are readily accessible by simply removing the cover.

The Ashley Engineering Co., 136 Liberty street, New York, the manufacturer of these water columns, claims that it is impossible to burn boilers, and that a great saving in fuel results where these devices are used. The floats are always dry inside, and there is nothing to get out of order.

This company's patent ball-top steam whistle is another device of merit. The accompanying illustration shows its construction very clearly. The bell is supported by branching arms which are cast in one piece with the body of the whistle. The hand upon which the bell is screwed is split between the arms, and when the bell is screwed into place it is held firmly in position. By this arrangement the lower edge of the bell is held in good alignment with the steam aperture. The bell, as will be noticed, is spherical in shape, and produces a deep and pleasant tone, which can be heard at a great distance.

ANOTHER TROLLEY LINE TO CONEY ISLAND.

The Brooklyn, Bath and West End Railroad of Long Island was recently sold to Mr. E. E. Denniston. The purchase price has not been made public, but it is supposed to be between $500,000 and $600,000.

This road was originally owned by Mr. Gunther, and is a popular way of reaching Coney Island. About six or seven years ago it was purchased by Mr. Jay Cooke, the well-known banker, and others of Philadelphia, Pa. They made many improvements and were the principals in securing the building of the Union depot on Fifth avenue, Brooklyn. The road, however, has not paid any dividends, and as a money-making investment it would never have been purchased. It is by looking into the future that its present holders see their way clear in making it pay.

The Atlantic avenue railroad has no outlet through New Utrecht to Coney Island. Mr. P. H. Flynn, president of the Kings county electric road, by securing the franchise along Fifth avenue from Thirty-ninth street to the city line has effectually blocked the Atlantic Avenue Company.

Mr. Denniston bought the road in the interest of the Brooklyn Traction Company. If it had been the Long Island Traction Company, President Lewis and his road would find the outlet so long desired, but that object has as yet not been obtained. It is evident that this road was purchased to give the Atlantic Avenue Company an outlet to Coney Island.

The motive-power of the Brooklyn, Bath and West End road could easily be changed to electricity, and at comparatively small expense. Thus cars could be run from South Ferry to Coney Island without a change. The power for this could be furnished from the new power house of the Atlantic avenue road, now nearly finished. It is rumored that this is the design of the Brooklyn Traction Company.

RECOMMENDS THE USE OF VESTIBULES.

Governor McKinley, of Ohio, in his message to the legislature, recommends that attention be directed to the welfare of motormen and conductors on street railways. There are in Ohio 12,000 of this class of workers, he says, and he thinks that electric and cable street-car companies should be required to provide vestibules on the cars for the protection of motormen and conductors from exposure to severe weather. He suggests, furthermore, that this class of roads might well be subject to the laws governing steam railroads.

Later information is to the effect that a bill has been passed in accordance with the above recommendation.

MEETING OF THE ADVISORY COUNCIL OF THE ELECTRICAL CONGRESS.

A meeting of the advisory council of the Chicago World's Congress of Electricians was held at the rooms of the American Institute of Electrical Engineers, New York, on Jan. 17.

The following gentlemen were present: Dr. Elisha Gray, chairman; Prof. Wm. A. Anthony, Prof. Chas. R. Cross, Dr. Louis Duncan, Dr. Wm. Geyer, Mr. Carl Hering, Mr. Geo. A. Hamilton, Prof. F. B. Crocker, Mr. A. E. Kennelly, Mr. T. D. Lockwood, Mr. T. C. Martin, Mr. Geo. M. Phelps, Dr. M. I. Pupin, Mr. R. W. Pope, Prof. H. A. Rowland, Mr. Herbert Laws Webb.

Mr. H. L. Webb was elected secretary of the meeting in the absence of Prof. Carhart, permanent secretary of the council. The preliminary reports of the English and American committees, already made public, were received.

It was resolved that the electrical congress of 1893 shall consist of two chambers, of which the legislative chamber shall decide on units, names of units and standards, and shall consist solely of delegates named by their respective governments.

A committee was appointed to determine the total number of official delegates and their apportionment to the various countries to be represented.

The following apportionment of delegates was made by the committee, whose report was adopted by the meeting. Great Britain 5, France 5, Germany 5, Austro-Hungary 5, United States 5, Belgium 3, Italy 3, Switzerland 3, Holland 2, Denmark 2, Norway and Sweden 2, Russia 2, Spain 2, Portugal 1, British North America 1, Australian Colonies 1, India 1, Japan 1, China 1, Mexico 1, Brazil 1, Chili 1, Peru 1, Argentine Republic 1—making a total of 55 official delegates.

It was resolved that a committee on invitations be appointed by the chairman, this committee to consist of 5 members, who shall select and recommend to the chairman the names of electricians, electrical engineers and others, who shall be members of the electrical congress; said committee to co-operate with the foreign committees.

It was further resolved that in addition to invitations to deliberating and voting members of the congress, a general intimation shall be extended through the journals or otherwise that the meetings will be open to the public for attending the proceedings, but not for taking part therein.

It was resolved that a committee on programme and papers be appointed by the chairman. This committee shall consist of eight members, whose duty it shall be to invite, receive and consider papers and other documents relating to the work to be done by the congress. And it was further resolved that it shall be the duty of this committee to formulate a programme for the congress.

It was resolved that the reports of the English and American sub-committees which were received at the meeting should be referred to the committee on programme and papers, and that the committee confer with the English committee as fully as possible, and with such other foreign committees as may be formed.

It was resolved that the electrical congress of 1893 shall last one week, beginning on Aug 21.

It was resolved that a committee of three be appointed by the chairman as a finance committee.

It was resolved that an executive committee of five shall be appointed by the chairman, said committee to have full power to act for the advisory council.

It was resolved that the question of charging a fee for membership of the congress and fixing the amount of such fee be referred to the executive committee.

HOW SHIPS ARE PROTECTED AGAINST LIGHTNING.

Thunder-storms on land do not compare with those at sea, where the lightning seems to have everything to itself and is particularly severe. Ships at sea are peculiarly liable to be struck by lightning when they are in the midst of a storm, on account of their masts offering an easy path for the electric fluid. It is obvious that there must be great danger attending the striking of a ship at sea by lightning, especially if the vessel has a cargo of inflammable goods, and the fact that many vessels are constructed of iron or steel is another element of danger in thunder storms. It is plain, therefore, that some way of protecting ships against possible disaster by lightning is an important necessity. This was recognized many years ago, and Sir Snow Harris of England devised a method of protecting ships from lightning discharges which has proved very effectual in practice. The system consists of running copper lightning-rods down the masts, connecting at the lower end with the copper sheathing of the vessel in case of a wooden ship. The upper ends of the rods extend a little above the tops of the masts and have platinum points. In iron vessels connection is made with the mass of metal, and in both cases the lightning is dissipated without damage. This system is of great value on board men-of-war, where there are large quantities of powder to protect, and were it not for the protection thus afforded it would be positively dangerous to be anywhere near a war-vessel during a thunder storm.

There are two ways of connecting the lightning-rod with the sheathing. One is to run the rod through the decks, down the masts, and make the connection at the bottom of the vessel, and the other is to run it across the deck from the point where the mast enters over the side, and down to the sheathing. This latter plan is considered the safer of the two.

The lightning-rods are run down the masts in grooves so as to not interfere with the hoisting of the sails and other operations.

So efficacious was Sir Harris' invention that the English government in 1845 conferred upon him the honor of knighthood in recognition of his valuable services, and it is now a well-known fact that damage to vessels protected in this way is almost unknown. Before the adoption of the system—and it met with considerable opposition at first—many ships were destroyed by lightning.

NEW SUBMARINE CABLE.

The steamer "Silverton" has left England having on board a new cable for the Central and South American Cable Company, which will be laid from Selina Cruz to Chorillas. In order to accomplish this object the cable company has increased its capital stock from $6,500,000 to $8,000,000. This corporation maintains several cables on the west coast of South and Central America and Mexico.

ELECTRICAL EXECUTION.

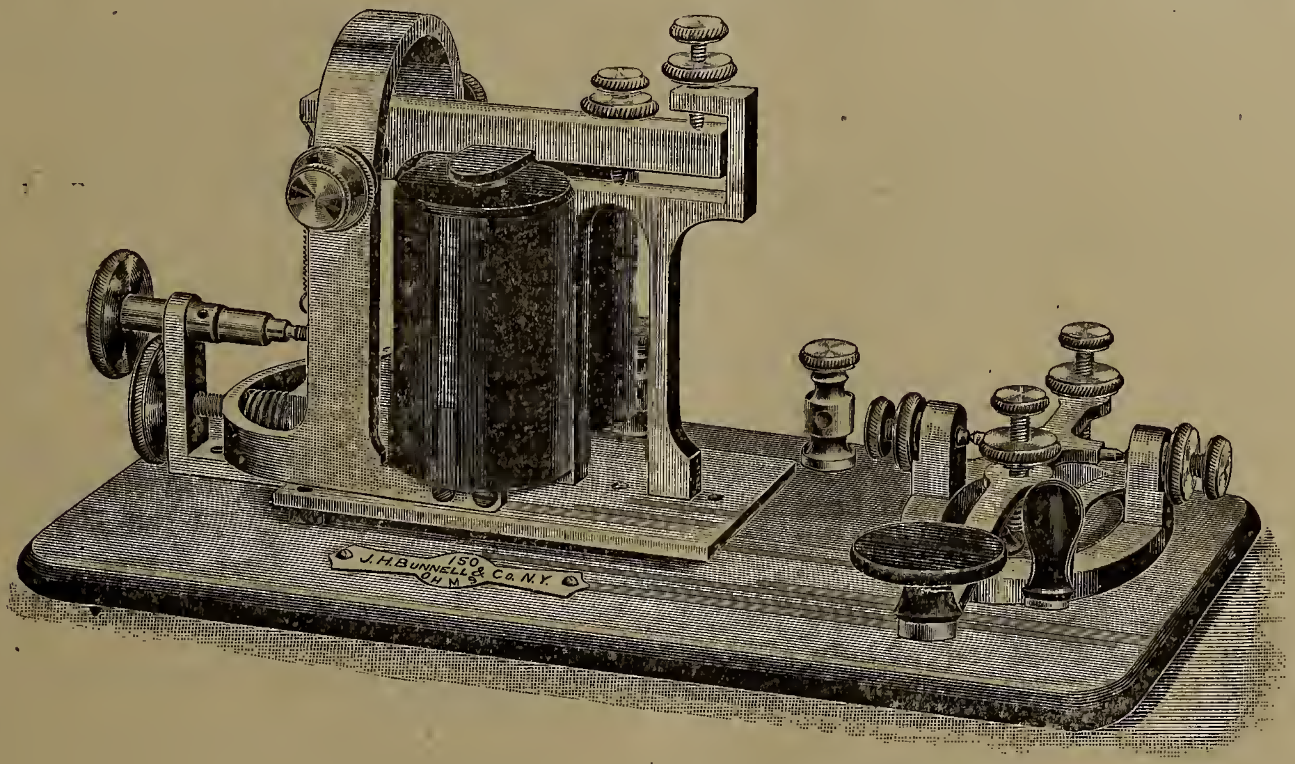
The electrical execution chair was again brought into action on January 16. Kornel Loth, a Hungarian, aged 26 years, was legally put to death by electricity in Clinton prison, Dannemora, N. Y., on that date, and as far as the despatches indicate the affair was a complete success. When the current was turned on it measured 1,725 volts and its strength was decreased. It was turned on full again and gradually decreased until it was nothing. This new method of applying the current seems to work all right.

MAIN LINE SOUNDER.

The accompanying illustration shows a newly devised instrument designed to supplant the telegraph apparatus known as the "box relay" and save the souls of telegraph operators from perdition. Every telegrapher who has struggled with the innocent-looking box relay during the course of his career will appreciate the force of the latter part of the first sentence. The box relay has been the cause of more profanity on the part of operators than any other device that forms a part of a telegraph system, and J. H. Bunnell & Co., of New York city, have performed a charitable and humane act in getting up the instrument referred to.

It is really a combination of a relay and sounder, and a key—the relay and sounder being one and the same instrument.

The magnets, which are wound to 150 ohms resistance, are attached to an L extension of an extra frame, which is pivoted at the same point with the armature-lever, and as the lower adjusting-screw is operated the magnets are caused to approach or recede from the armature, as the case may be. The upper screw is to adjust the tension of the armature-lever spring, and, the two adjusting screws being so close together, the adjustment of the magnets and the tension on the armature can be performed with the left hand.



J. H. BUNNELL & CO.'S MAIN LINE SOUNDER.

This instrument is said to be capable of fine adjustment and keeps it over a wide range of current strength, therefore it is equal to the ordinary relay in this particular. Being fitted with the parts of the regular sounder, it performs the functions of both relay and sounder, and it gives a vastly greater volume of sound than does the box relay.

The use of this instrument does away with a local battery and independent sounder, and no doubt it will find an extensive use in small offices and on private lines.

PERSONAL.

Dr. Toms has resigned the presidency of the Electric Light and Telephone Company of Salt Lake City, Utah. His successor has not yet been chosen.

M. D. Law, well known in the electrical fraternity, is now connected with the Love Electric Traction Co., of Chicago, as its electrical engineer. At the present time he is in Washington, D. C., superintending the work of constructing the line that is to be operated on the Love system. He is putting down and equipping 1,200 feet of double track, and it involves many difficult engineering tasks. The work includes changing the electric equipment from overhead to underground trolley, the road crossing two cable lines and its own lines. The engineering problems are therefore of an extraordinary and difficult nature.

INJUNCTION DENIED.

In a suit for an injunction against the Accumulator Company, brought by the Brush Electric Company to restrain the former company from using certain patented articles, Judge Green, in the United States Circuit Court at Trenton, N. J., denied the application. The judge held that the use of the articles was such as might be performed without pecuniary injury to the complainant.

NOTES OF GENERAL INTEREST.

THE Belknap Motor Company, Portland, Me., has recently closed a contract with the Portland Stoneware Company for a 150-light B. C. Standard dynamo.

FROM January 1 last, for a period of five years, the islands of Trinidad and Tobogo, West Indies, will admit, free of duty, dynamos, lamps, wire, steam engines, boilers, etc.

THE Bell Telephone Company, of Rochester, N. Y., has been sued for $20,000 damages by F. E. Sloat, a well-known horseman of Brockport, N. Y. Through the result of an alleged blunder on the part of a telephone operator the services of a veterinary surgeon for one of Sloat's horses was delayed and the animal died in consequence, it is alleged; hence the suit.

THE Jenney Motor Company, of Indianapolis, Ind., has constructed an electric plant for the Williams & Powell Bros.' Works Company, of Cincinnati, Ohio.

THE Bristol (N. H.) Electric Light Company has declared a dividend of 6 per cent.

LYNDONVILLE, VT., talks of having electric lights.

MARION, N. J.—Chancellor McGill, of New Jersey, has ordered that the electric-light plant at Marion, N. J., belonging to the United Traction Company, be sold either at private or public sale.

EAST ORANGE, N. J., is considering the advisability of electric lights for the streets.

GEORGETOWN, TEX., is discussing the electric-light question.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Bristol, Vt.—A movement is on foot to have the streets lighted by electricity.

Lewiston, Idaho.—This place is to have a new electric-light plant.

New York, N. Y.—It is proposed to build a trolley line from the Great Neck terminal of the Long Island railroad, which is 18 miles from New York, to run through Manhasset to Fort Washington, a distance of 5 miles. There is no railroad covering this territory, so that it is expected to be a profitable undertaking. Communicate with J. H. Bunnell, 76 Cortlandt street, New York, on the subject.

West Bridgewater, Mass.—An electric-light plant is wanted by the people of this place.

Altoona, Pa.—The council has passed an ordinance granting the Altoona and Logan Valley Electric Railway Company permission to construct and operate an electric railway in this city.

Asbury Park, N. J.—It is proposed to construct an electric railway to connect this place with Freehold.

Bristol, R. I.—A charter has been applied for to construct a tramway in this town.

Camden, N. J.—A company has been organized to construct an electric railroad between this place and Woodbury.

Carthage, Mo.—A company is being formed to construct and operate a street railway here. Major H. H. Harding and C. L. Bartlett are said to be promoters of the project.

Durham, N. H.—It is projected to connect this place with Salmon Falls by an electric railroad, which will run through the city of Dover. The proposed road will be about 7 miles long.

Homestead, Pa.—An ordinance has been passed by the council granting right of way over certain streets to the Homestead and Highland Street Railway Company. It is said the road will extend to McKeesport.

New Britain, Conn.—There is a project on foot to construct and operate a street-car line here.

Newtonville, Mass.—The Newtonville Street Railway Company has petitioned for permission to construct and operate an electric street railway to Watertown.

Norristown, Pa.—It is said that James W. and Daniel Shepp of Philadelphia are interested in the project of constructing an electric road between this place and Philadelphia to connect with the Citizens' line.

Pittsburg, Pa.—There is a project on foot to connect Monongahela city with West Brownville by an electric railway. H. H. Sweeney of Pittsburg is actively interested.

Rochester, N. Y.—The new street-railway company is endeavoring to obtain permission to construct its tracks through Chatham street to Windsor Beach and North Park.

St. Johnsbury, Vt.—The St. Johnsbury Street Railroad Company has been incorporated to construct and operate a street railway in this city.

South Groveland, Mass.—The residents of this place are anxious to have a street railway constructed to connect this village with Haverhill.

Southampton, N. H.—It is proposed to build a street railway in this place. Benjamin R. Jewell, Joseph J. J. Sawyer and Frank Jewell are interested in the project.

Wallingford, Conn.—A company is being formed here for the purpose of constructing and operating an electric railroad from this city to Meriden. Address H. F. Hall, Wallingford.

Waverly, N. Y.—A franchise has been granted to Messrs. A. N. Broadhead, A. C. Wade, C. M. Dow, S. B. Broadhead, and William Broadhead for an electric railroad to run through Sayre to Athens, Pa.

Brooklyn, E. D., N. Y.—The Twenty-third Street Ferry and Newtown Railroad Company is to build a street railway, to be operated by the trolley system, from foot of Broadway to Cypress Hills Cemetery. The road will be six miles in length.

Wilmington, Del.—An electric railway will be built in the near future between here and Newcastle.

Windsor, Conn.—There is a movement on foot to establish an electric railroad between here and Hartford. Those at the head of it are very enterprising and it looks as though they would be successful in the undertaking.

Worcester, Mass.—The Worcester and Shrewsbury Railroad Company proposes to construct and operate an electric line between this city and Marlborough.

NEW CORPORATIONS.

Chicago, Ill.—The Superior Electrical Company. Capital, $39,000.

Denver, Col.—The Durango Light and Power Company. Capital, $200,000. Incorporators: Clinton Reed, Sam P. Rose and E. R. French.

Hartford, Conn. — The Waterhouse Electric Company for the manufacture and repair of all kinds of electrical apparatus. Capital, $20,000 Incorporators: A. G. Waterhouse, F. G. Waterhouse and L. G. Waterhouse.

Havana, Ill.—The Havana Electric Company will construct and operate an electric-light and power plant.

Lewiston, Ia.— The Lewiston Electric Light Company has been formed to supply this city with electric light.

Sedalia, Mo.—The Sedalia Water and Light Company, for the construction of water, gas and electric-light works. Capital, $500,000.

INCREASE OF CAPITAL.

New Haven, Conn.—The New Haven Electric Company has increased its capital from $300,000 to $400,000.

Spartanburg, S. C.—The Spartanburg Electric Light and Power Company has increased its capital from $30,000 to $75,000.

ELECTION OF OFFICERS.

Bristol, N. H.—The Bristol Electric Light Company has recently re-elected the following officers: D. M. Calley, clerk. Directors: Geo. A. Emerson, Geo. C. Currier, Ira A. Chase, Charles H. Dickinson, Chas. H. Proctor, S. H. Cross and O. W. Rice.

Chester, Pa.—The Chester Electric Light Company's annual report shows the company in a prosperous condition. The present officers and board of directors were re-elected, as follows: President, G. P. Denis. Board of Directors: F. G. Sweeney, C. W. Perkins, N, A. W. Darling, J. R. Sweeney, H. B. Black, Joseph Deering, John McGolrick, H. J. Riley, D. P. Paiste, William Burnley.

Washington, Pa.—The People's Light and Heat Company on January 3 elected the following officers: Samuel Hazlett, president; J. B. R. Streator, secretary; Geo. L. Caldwell. treasurer. Directors: A. M. Todd, Samuel Hazlett, Geo. L. Caldwell, J. B. R. Streator and Wm. L. McCleary.

Rockland, Me.—Efforts are being made to consolidate the electric-light and gas companies here.

The Contrexville Plush Company, Manville, R. I., has bought a dynamo for the purpose of putting electric lights in its tenement-houses in the village.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, Jan. 14, 1893.

J. Edward Wallace, of Smith & Wallace, 8 Oliver street, Boston, was in town last week.

Mr. George M. Phelps, treasurer of the Electric Club, has been appointed temporary receiver of the club.

H. C. Adams, Jr., on January 1 last was appointed agent of the Fort Wayne Electric Company, with offices at 44 Broad street.

The Shultz Belting Company, of St. Louis, Mo., Mr. A. B. Laurence, manager of the New York city headquarters, 225 Pearl street, has issued a large and handsome calender for 1893. It is an ornament to any office.

Patrick J. Gleason, Long Island City's pugilistic ex-mayor, is again brought into prominence. He indorsed some notes of the Long Island Electric Illuminating Company in favor of the International Okonite Company, of this city. Last week judgment for $,348 was entered on one of the notes.

One day last week a 450 incandescent light dynamo, of P. Claus & Co.'s well-known make, on a truck standing on Broadway, attracted a great deal of attention on account of its handsome appearance and finish. The machine was on its way to the Cotton Exchange, and the driver of the truck had stopped to indulge in lunch when the crowd were attracted to the machine.

B. W. Payne & Sons, the well-known engine-makers of 41 Dey street, have just closed a contract for two 200 H. P. high-speed Corliss automatic engines, to be installed in the power-house of the new electric railway company in Kingston, N. Y. These engines are belted direct to the generators. B. W. Payne & Sons manufacture Corliss compound and automatic engines for electric-power generation from 2 to 300 H. P.

The New York Equipment Co., 15 Wall street, has our thanks for the souvenir vest-pocket memorandum tablets received. These tablets are very handsomely gotten up; they are made of celluloid in imitation of ivory, and there is one tablet for each day in the week. They are extremely convenient and handsome in appearance, and all users will be constantly reminded that the New York Equipment Company is in the railway equipment business and wishes to have all intending purchasers drop a line to them.

Mr. L. F. Requa, General Manager of the Safety Insulated Wire and Cable Co., of No. 234 West 29th street, New York city, had a narrow escape from death on January 19. Mr. Requa was a passenger on the express train which ran into the rear end of a local train on the Pennsylvania road on the evening of the date mentioned. One passenger was killed instantly and many were injured seriously. Mr. Requa's injuries consisted of a slight scalp wound. He was on his way to Philadelphia when the accident occurred.

Mr. H. C. Adams, New York representative of the Phillips Insulated Wire Company, of Pawtucket, R. I., with offices at 39 and 41 Cortlandt street, city, feels quite at home in his new enterprise. He was for 10 years associated with one of the largest wire manufacturers in the United States, so it is no new business for him. He was in the electric lighting business for a number of years; he left the management of the Fort Wayne Electric Company to return to his old love. The company he now represents is one of the oldest in the business and stands high. It makes a specialty of O. K. weatherproof electric-light wire. W. T. H.

ELECTRICAL STOCK QUOTATIONS.

The following are the latest prices for electrical securities in New York, as quoted by Geo. B. Ellery, financial editor Electrical Age.

Names of Companies.	Capital.	Par.	Price.
American Dist. Tel., N. Y....	3,825,000	100 00	58 00
American Telegraph and Cable.......	14,000,000	100 00	87 00
American Visual Telegraph Co.. ...	500,000	100 00	†75 00
Bell Telephone...................... .	17,000,000	100 00	205 00
Bell Telephone 7s......................	2,000,000		*113
Boston Electric Light Co.............	1,500,000	100 00	117 00
Brooklyn Edison Electric Light......	1,500,000	100 00	104 50
Brooklyn Edison Electric Light, 5s...	500 000		*100
Brooklyn Citizens' Electric Light.....	500,000	100 00	155 00
Brooklyn Municipal Light............	500,000	10 00	17 00
Brush Elec. Lt. Co. pref., Balto......	600,000	100 00	80 00
Brush Elec. Lt. Co., Balto., 5s........	200,000		*105
Brush Elec. Ill., N. Y....	1,000,000	100 00	30 00
Brush Elec. Ill., 6s, N. Y.............	300,000	100 00	*102
Brush Elec. Co., Parent..............		50 00	40 00
Brush-Swan E. L. Co. of N. E.........	2,000,000	100 00	20 00
Burrell Electric Signal Co., N. Y.....	500,000	20 00	10 00
Chattanooga Elec. Lt. Co., Tenn., 6s..	200,000		*101
Chattanooga Elec. Lt. Co., Tenn.	100,000	100 00	92 75
Chicago Gas..........................	25,000,000	100 00	89 50
Columbia Chronophone Co., Phila....	500,000	25 00	35 00
Commercial Cable Co................	7,716,000	100 00	174 50
Cons. Gas Co., N. Y..................	35,430,000	100 00	129 75
Cons. Subway Co., N. Y.............	3,000,000	100 00	25 00
Detroit Elec. Lt. & P. Co.............	300,000	25 00	14 00
Detroit Elec. Lt. & P. Co. 6s..........	300,000		*101
Detroit Electrical Works.............	1,000,000	10 00	4 50
Direct U. S. Cable Co., Ltd...........	6,400,000	100 00	50 00
Edison Elec. Ill. 5s, N. Y.............	3,050,000		*117
Edison Elec. Ill., Lebanon, Pa...	80,000	10 00	13 75
Edison Elec. Illuminating, N. Y.....	6,500,000	100 00	119 00
Edison Electric Light Co., Phil.......	2,000,000	100 00	105 00
Electric Protection Co., N. Y........	100,000	100 00	75 00
Elec. Sup. & Con. Co., N. Y..........	120,000	15 00	16 00
Electrical Forging Co................	2,000.000	100 00	85 00
Elmira Municip. Imp. Co., 5s........	1,800,000		par
Erie Telephone........................	4.800,000	100 00	50 00
Fort Wayne Elec. Co..................	4,000,000	25 00	13 00
Franklin Electric Co.. N. Y..........	5,000,000	100 00	†83 00
Fremont E. L. & P. & Gas Co., O....	95,000	100 00	102 50
General Electric Co..................	50,000,000	100 00	111 25
General Electric Co.. 5s..............	7.931.000	10 00	*100
General Electric pref.................	4,223,700	100 00	113 00
Great West. Elec. Sup. Co. pref. 8s....	350,000	10 00	10 00
Guarantee Identification Co., N. Y....	50,000	50 00	40 00
Hickory Electric Co., N. C...........	12,000	100 00	112 00
Interior Conduit & Ins. Co., N. Y....	1,250,000	100 00	75 00
Int. Okonite, Limited................	1,700,000	50 00	49 00

Laclede Gas Co	7,500,000	100 00	24 00
Laclede Gas pref.	2,500,000	100 00	70 00
Laclede Gas 5s.	10,000.000		*86
Law Telephone	400,000	100 00	96 00
Livingston E. Lt. Co., Mont., 6s.	30,000		*92
Marshalltown Elec. Co. 6s. Iowa	65.000		*98
Marysville L. & W. Co. 6s, Ohio	60.000		*98
McLeod Railway Equip. Co	3,000,000	25 00	35 00
Metropolitan Elec. Signal Co., N. Y.	1,500,000	100 00	35 00
Metropolitan T. & T., 5s.	2,000,000		*103
Metropolitan Traction			138 00
Morristown L. H. & P. 5s, N. J	30,000		*102
Morristown L. H. & P.	50.000	100 00	101 00
Nat'l Elec. Manuf. and Const. Co., N. Y.	50,000	100 00	101 00
N. E. Tel. & Tel. Co.	10,394,600	100 00	59 00
N. Y. and N. J. Tel. and Tel. 5s	1,500,000		*98
N. Y. and N. J. Telephone Stock	2,535.000	100 00	98 25
N. Y. Storage Battery	100,000	100 00	96 00
North American Railway Co.	39,767,200	100 00	11 00
Postal Telegraph	10,000.000	100 00	81 00
Peninsular Elec. Lt. & P. Co., Va.	30.000	10 00	9 50
Pettingell Andrews Co., Boston.	200,000	25 00	30 00
Pittsburg Reduct. Co., Aluminum	1,000,000	100 00	105 00
Rockaway Elec. Light.	50.000	100 00	40 00
Sawyer-Man Elec. Light Co., N. Y.	125.000	100 00	100 00
Shaver Corporation. N. Y	100.000	1 00	8 00
Short Elec. Ry. Co., Cleveland, O.	5.000,000	10 00	8 00
Standard Ug'd Cable Co., N. Y	1,000.000	100 00	80 00
Suffolk Electric Co., Boston	300,000	10 00	10 50
Swan Incandescent	800,000	100 00	6 00
The Gamewell Fire Alarm Tel. Co.	750,000	100 00	100 00
The Hall Signal Co., N. Y	1,900,000	100 00	100 00
The Hall Signal Co. pref., N. Y	100.000	100 00	115 00
The Ongley Electric Co., N. Y	250,000	100 00	85 00
The Siemens & Halske Co., Ill.	500,000	100 00	par
The Washington Wat. Pow., Wash.	1,500,000	100 00	90
The Wells & French Co., Ill.	600,000	100 00	par
T.-H. Electric Co. 5s, N. Y	500,000	30 00	*101
U. S. Rubber Co.	13,481.000	100 00	44 50
U. S. Rubber Co. pref. 8s.	12,942,500	100 00	98 00
Western Union	100,000.000	100 00	96 50
Westinghouse Elec. & Manf. Co	7,000,000	50 00	35 00
Westinghouse Elec. Co. pref. 7s.	4,000,000	50 00	50 00
West Point W. Lt. & P. Co., Va.	25,000	100 00	101 00

*Per cent. †Registered stock.

FINANCIAL.

A new law, just formulated in the New York legislature, offers food for reflection to every man who has a financial interest in electricity; it is to the effect that every vehicle on the public streets of the cities of the State shall have a light after dark to warn people of its approach. Here is an opportunity for every description of portable lamp or storage battery, as it will be impossible to designate any particular lamp or system, and if the law is enforced to any extent the number of each will be many. All over Europe incandescent lamps for the carriages of the wealthy and a great many of the public omnibuses are and have been supplied, and the number is constantly increasing. The grand pride of an Englishman is to be isolated, and get what he pays for. His first-class cars are compartments only in a general car, and he has one of three seats · for some time each one of these has been supplied with its incandescent lamp, at the traveller's disposal for a penny an hour. The satisfaction of owning it and not permitting others to read by it was his pleasure. We should and no doubt will have the same general principle here, but on a line large enough to class it as a paying investment to enter upon.

The St. Louis and Chicago electric scheme seems to have frozen up. I have traced the history of so many matters of the kind that unless this is placed on a sound commercial basis holding the public confidence that I shall forget it was ever conceived and turn my allegiance over to the next one of the same nature. That there should have been any trouble in securing capital to construct and equip that piece of electric road I cannot imagine, had it been asked for in a business way; but when a small loan was called for, and even at that the New York Trust Co. had not received a form of application when I called to subscribe, I felt it was a failure. And now comes a controversy as to whether the manufacturers of the United States can furnish the machinery. One might as well ask, Have we the ground to run on? Either the General Electric or the Westinghouse companies is prepared to do the work under bond exactly as they would any other, and they will compete for the contract, but they are not building electric roads for glory any more, and want to see their money secure before closing the contract—very properly too.

The Stock Exchange opens the season beautifully and all bids fair for a grand spring business. The industrials still lead, of course, and the concentration of capital into particular interests proves positively the greater profits to be made by curtailing expenses in location, plant and management. I note but one stock which seems to be in the dumps—Thurber, Whyland & Co. Their common stock sells for 40, while H. B. Claflin & Co. stands above par. The Interior Conduit and Insulation Company has listed its stock on the Exchange, and it starts off in the neighborhood of par. It is a good investment stock, but the fact of its being dealt in on the Stock Exchange means that a customer at a price is always at hand. The Edison Illuminating of New York seems to have started for the prize. It is quoted now at 125, having risen in six months from the eighties. Queen & Co., of Philadelphia, a supply-house known all over the world, have just organized as a public company with a capital of $600,000 and a trade that is limitless. This should take in the other large supply concerns on last year's plan. The Shaver corporation has increased its capital to $2,000,000 and is quoted at 75. This is the leading automatic telephone company of America and will be a factor in the general telephone elucidation this year The January thaw is due and will enliven the whole land; our crops are insured by the late snows and the hour is here to make that pile all have been after so long.

THE ST. LOUIS CONVENTION.

Mr. C. O. Baker, Jr., master of transportation of the National Electric Light Association, has issued a notice, of which the following is a copy:

"The various passenger associations have granted an excursion rate of a fare and a third to delegates attending the convention of the National Electric Light Association, to be held in St. Louis, Feb. 28, and March 1 and 2, 1893. To secure this rate it will be absolutely necessary for persons purchasing tickets to state to the agent from whom the purchase is made that they contemplate attending said meeting, and to procure from said agent a certificate which, immediately upon their arrival in St. Louis, should be left in the secretary's office, addressed to the undersigned, who will see that it is properly vised and returned to the owner.

"Arrangements are now being made for a special train from New York to St. Louis, which will exceed in the way of equipment and appointments anything that has ever been in service between these two points. To bring this matter to a successful issue, it is very important that the number of passengers who wish to avail themselves of this train should be known at the earliest possible moment. Therefore it is very desirable, and will facilitate transportation matters greatly, if all delegates who contemplate using this train will make application for space at once.

"C. O. BAKER, JR., 136 LIBERTY ST., NEW YORK."

MILITARY SIGNALLING.

D. Appleton & Co., publishers, New York city, have just issued a "Hand-Book of Military Signalling," which will be found of much interest to those concerned in military matters. It is prepared by Captain Albert Gallup, signal officer First Brigade, National Guard State of

New York, and the system set forth therein has been approved of by the commander-in-chief, who has issued an order that all its provisions be strictly observed by all concerned.

The instruments used for signalling are the wand, the flag, the torch, the ball, lanterns, heliographs, the collapsing drum, telegraph instruments, trumpets, whistles, foghorns, or any other means of producing either a long and a short sound, or a long and a short exposure. The American Morse alphabet is used in all cases, whatever the instrument may be.

For signalling with the flag or torch the dot is represented by a motion to the right and the dash by a motion to the left of the sender, the spaces being represented by a "front" motion.

Full instructions are given for signalling by means of all the various apparatus. The field telegraph equipment is also fully described, and is of two kinds: that for the "flying" telegraph and the train for erecting permanent or semi-permanent lines. The cable named for the "flying" telegraph is of the Okonite Company's make, and plain directions are given for its proper handling, etc.

The book is of a very convenient size for quick reference, and the subject-matter is interesting even to those having no particular liking for military matters. The price is 50 cents.

"M-V" INSTRUMENTS.

Queen & Co., Incorporated, Philadelphia, are congratulating themselves upon the increasing demand for their "Magnetic Vane" ammeters and voltmeters, as evidenced by the fact that more than twice as many of these instruments were sold by them in 1892 than in the preceding year. This advance is perhaps not astonishing when efficiency and cost of the apparatus are considered, but it shows a degree of appreciation on the part of purchasers that is very significant. The "M-V" instruments are adapted for constant switchboard use, and voltmeters as well as ammeters can be left in circuit constantly, a feature of great importance to the central-station manager. The makers are manufacturing in large quantities to supply demands which come from all over the United States. A number of prominent dynamo building companies have adopted the above type to install with isolated plants for incandescent lighting and for power circuits. Descriptive circular No. 420, recently issued by Queen & Co., contains further information of value and will be mailed upon application.

EUREKA PACKING.

It is very evident that Eureka packing is a great favorite with engineers, or Hine & Robertson, New York, would not have placed such a large order as the following. They say this is only a starter, and expect to duplicate the same at an early day. That must make the manufacturers feel good.

MESSRS. HINE & ROBERTSON: JAN. 3, 1893.

Your favor of the 30th ult., ordering 50,000 of "Eureka" packing as a starter for 1893, was duly received. In accepting the same we take pleasure in saying that we believe this to be the largest single order for any kind of packing ever placed with a manufacturer, and, with your promise to duplicate the order at an early day, we consider it a strong proof of the favor in which Eureka is held by engineers throughout the United States.

Yours truly,
EUREKA PACKING CO.

TRADE NOTES.

THE National Electric Railway Improvement Co., Broadway and State street, Albany, N. Y., which controls the Sabold Electric ground-rod system for electric railways, and also installs the same, is having plenty to do these days. The superiority of this system over others is being found out and the company is equipping roads in Massachusetts and Illinois. The Sabold system of ground-rods was described and illustrated in our issue of January 7 last.

QUEEN & Co., incorporated, Philadelphia, have sold nearly all the Ayrton and Perry ammeters and voltmeters, which they advertised so extensively at reduced prices, but a few still remain which are offered at a mere fraction of the original manufacturing cost. Any one who wants a portable instrument for general testing, where great accuracy is not required, will find it very advantageous to purchase now, before the stock is entirely exhausted. Descriptive circular No. 355 will be mailed by the makers upon application.

The Electrical Age's Illustrated Record of Patents.

Issued January 17, 1893.

489,931. Pneumatic Dispatch or Transit System. Henry Clay, Philadelphia, Pa., assignor to the Electric Pneumatic Transit Company, same place. Filed Oct. 26, 1889.

489,932. Pneumatic Dispatch or Transit System. Henry Clay, Philadelphia, Pa., assignor to the Electric Pneumatic Transit Company, same place. Filed Oct. 26, 1889.

489,938. Electric Battery. John H. Davis, Detroit, Mich. Filed March 28, 1892.

489,944. Electric-Railway Switch. August C. Goetz, Milwaukee, Wis. Filed Sept. 27, 1892.

489,972. Electric-Car Brake. Andrew C. Miller, Auburn, N. Y. Filed Nov. 30, 1891. Renewed Aug. 17, 1892.

489,983. Electric Cut-Out. William B. Potter, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed July 5, 1892.

489,990. Telephone. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 1, 1888.

490,011. Electric Meter. Fernando J. Dibble, Peabody, Mass. Filed Nov. 21, 1891.

490,012. Electric Telemeter-Transmitter. Fernando J. Dibble, Peabody, Mass. Filed Nov. 21, 1891.

490,013. Electric Telemeter-Transmitter. Fernando J. Dibble, Peabody, Mass. Filed Nov. 21, 1891.

490,014. Electric Telemeter System. Fernando J. Dibble, Peabody, Mass. Filed May 12, 1892.

490,028. Trolley. John C. Love, Chicago, Ill., assignor to the Love Electric Traction Company, same place. Filed May 17, 1892.

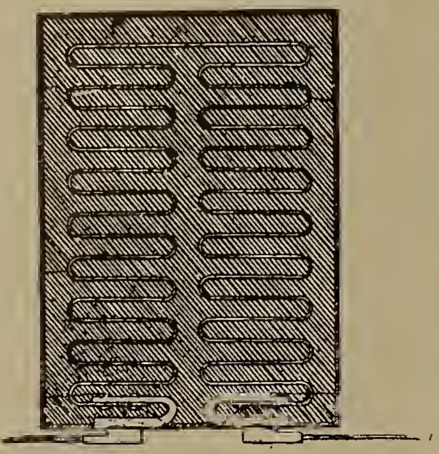
490,034. Electric Heater. Thomas E. Morford, Minneapolis, Minn., assignor, of one-half, by direct and mesne assignments, to the Enamel Insulator Company of Illinois. Filed Dec. 19, 1890.

490,064. Telegraphy and Telephony. Fred. H. Brown, Chicago, Ill., assignor, by mesne assignments, of one-fifth to the Brown Telephone and Telegraph Company, same place. Filed Feb. 27, 1891.

490,070. Wire Stretcher and Splicer. Lawson H. Dowell, Walton, assignor of one-half to Daniel R. Murchison, Athens, Texas. Filed Oct. 1, 1890. Renewed Dec. 14, 1892.

490,081. Commutator-Brush and Holder. James F. McLaughlin, Philadelphia, Pa. Filed March 31, 1890.

490,082. Electric Heater. James F. McLaughlin, Philadelphia, Pa. Filed April 28, 1892.



490,082.—ELECTRIC HEATER.

490,161. Electric Alarm-Lock. Joseph A. Nadeau. Detroit, Mich. Filed Sept. 2, 1892.

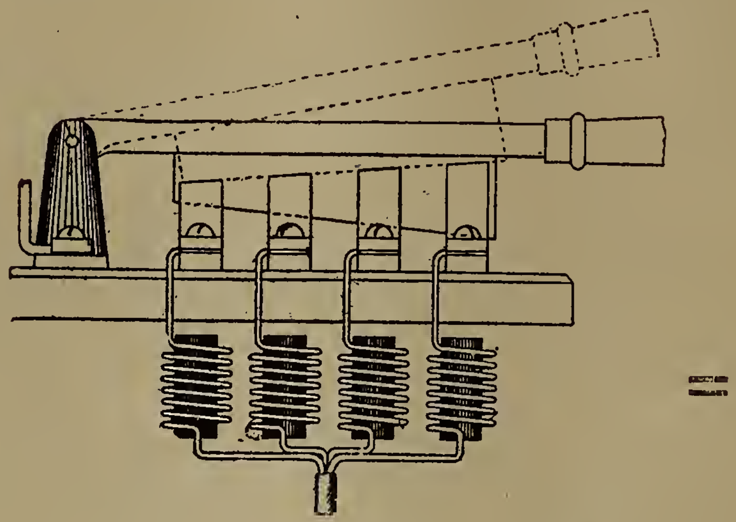
490,178. Electric-Circuit Breaker. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed Oct. 28, 1892.

490,183. Commutator-Brush. Carl O. C. Billberg, Philadelphia, Pa., Filed Sept. 20, 1890.

490,211. Automatic Releasing Device. Hans P. Nielsen, Alameda, Cal. Filed Sept. 14, 1892.

490,231. Galvanic Battery. Noah M. Powell, Galesburg, Ill., assignor to the United States Burglar Alarm Company, same place. Filed Dec. 19, 1891.

490,248. Electric Railway System. Thomas Harris, Detroit, Mich., assignor to the Harris Electrical Propulsion Company, Limited, same place. Filed Dec. 28, 1891.



490.178—ELECTRIC-CIRCUIT BREAKER.

490,254. Secondary Battery. Henry H. Lloyd, Philadelphia, Pa., assignor to the Electric Storage Battery Company, Gloucester City, N. J. Filed Aug. 30, 1892.

490,256. Electrically-Heated Soldering Iron. George R. Meitzler, Cincinnatti, Ohio, assignor of one-half to William H. Osborne, Prince's Bay, N. Y. Filed March 31, 1892.

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ELECTRICAL AGE

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INCANDESCENT LAMP SITUATION.

The result of the suit of the General Electric Company against the Beacon Vacuum Pump and Electrical Company will be watched with interest. The fact of the refusal to grant a temporary injunction shows which way the wind blows, but what will be the result when the wind stops blowing no one now can tell. The final issue deciding the granting or not of a permanent injunction will now have to be awaited for, and with this will also be decided whether the claims of Mr. Goebel are not superior to those of Mr. Edison.

The evidence produced by the numerous affidavits of the defendant is certainly strong. But it is too early to say whether or not that evidence is to be taken as conclusive. If the General Electric Company had anticipated this mass of evidence and prepared for it, then we might safely say that the case was for all practical purposes decided. As it is, the attorneys for the plaintiffs were taken by surprise and so were unprepared with counter-affidavits. What evidence the plaintiffs will use to rebut these affidavits is not yet known and probably will not be until the final trial. Mr. Eaton, counsel for the General Electric Company, in remarks stated elsewhere in this issue has indicated that there was a defence, but its exact nature and extent he leaves in mystery.

All that can be done now is to await the final issue. Any judgments given now would be jumping at conclusions. At the present time the refusal of the injunction may make an aperture through which all the factories that have shut down can have the various injunctions dissolved and resume operations. This means an undoing of what had been done by the General Electric Company.

THE BLAKE TRANSMITTER.

It will be of interest to those concerned in telephone matters to know that the four patents covering the Blake transmitter expired in this country on January 20 last. It may also surprise many to know that the United States patent had a life of only a trifle over 11 years, instead of 17 years, which is the maximum limit of time given for the protection afforded by a patent in this country. The reason for the short lives of these patents is found in the fact that the English patents on the same inventions expired on the date mentioned, and as the life of an American patent is limited by that of the shortest foreign patent, the result in this case was the deprivation of the telephone company of the fruits of the monopoly of this valuable instrument for a period of nearly six years.

The Blake transmitter is as essential to the telephone as the receiver, and represents the highest degree of perfection in this instrument. It is marvellously sensitive, and through its adoption the Bell Telephone Company conferred a great benefit on its patrons and at the same time brought many dollars into its treasury. A poor transmitter would have disgusted people with the telephone and the number of instruments in use would probably be less than it is.

The expiration of the patents will have the effect of creating a new industry—the manufacture of Blake transmitters. Indeed we know of one house which has been overwhelmed with orders for Blake transmitters since the expiration of the patents was publicly announced.

STORAGE BATTERIES FOR ELECTRIC LIGHTING.

We give elsewhere in this issue the portion of the report of Mr. R. R. Bowker, vice-president of the Edison Illuminating Company, of this city, referring to the experiments now being made by that company in the use of a storage-battery plant as an auxiliary to the regular dynamo plant in one of the company's stations. The result of the experiment will be awaited with interest.

THE LAKE ROLAND ELEVATED RAILWAY, BALTIMORE.

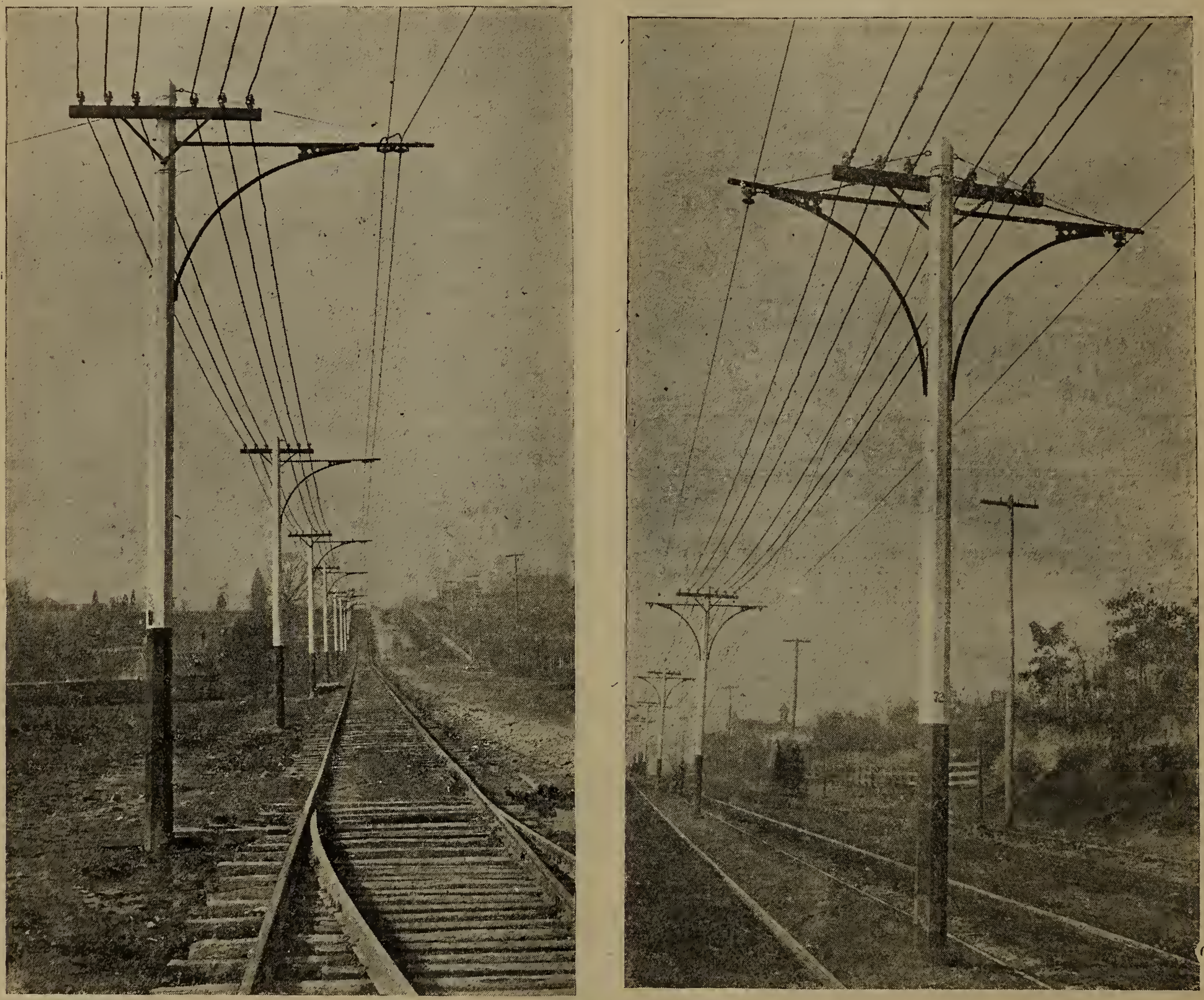
From a street-railroad standpoint Baltimore has always, until recently, been celebrated for the antiquity of its street-car equipments and the extreme lack of enterprise in the operation of the roads. But one day enterprising capitalists took it into their heads to revolutionize the existing condition of things by the introduction of the trolley system. At once the people were aroused, and in due time all plans were laid for the adoption of electric power, and it can be truthfully said that Baltimore has not experienced such an awakening for many a year. The trolley is mainly responsible for this, and the town, no doubt, has already begun to feel the material benefits resulting from the introduction of the system in the city.

The Lake Roland Elevated Railway Company, of Baltimore, which we are about to describe, is a unique enterprise. It probably is entitled to the distinction of being the first elevated railroad in this country operated by electricity, and promises to boom things in and about Baltimore in a way that will make the hearts of the citizens glad.

The road runs through the heart of the city to Oak street, where it branches off in two directions, one branch extending up North avenue to Woodberry and the other through Roland Park to Lake Roland.

Eight thousand feet of the track in the heart of the city is on an elevated steel structure, built by the Pennsylvania Steel Co., of Steelton, Pa., spanning the Northern Central Railway tracks on North street, from Eager to Lexington streets. There are also 1,280 feet of elevated track on a steel structure which spans Atkinson's stone quarry. This structure is 40 feet high at its highest point, and is now being erected by the Variety Iron Works of Cleveland, Ohio. This company is also contractor for the trusses used in the roofs of the power station and car-house.

The power station is located on the Falls road, at the intersection of Jones' Falls and Stony Run, and is 126 x 56½ feet in size, and the car-house is located at Roland Park, its dimensions being 200 x 108 feet. Both the power station and the car-house were built by Ehmann, Jones & Thorne, of Baltimore, and are constructed of stone, with iron truss roofs, the trusses being furnished by the Variety Iron Works, of Cleveland, Ohio. Both buildings are thoroughly fireproof, and are constructed and equipped in the best manner possible.



OCTAGONAL WOODEN POLES ALONG THE LINE OF THE LAKE ROLAND ELEVATED RAILWAY, BALTIMORE.

The steam-plant consists of two 750 H. P. tandem compound condensing engines; six 250 H. P. vertical boilers; two 20-inch driving-pulleys, weighing 20 tons each, with 40-inch face, to each engine, to belt directly to four 400 H. P. Thomson-Houston multipolar generators. The plant is being erected by the Corliss Steam Engine Co., of Providence, R. I. The rolling-stock consists of 25 double-truck Pullman cars, each 35 feet in length, equipped with two No. 16 Edison motors, and Maguire trucks; two Westinghouse single truck cars, each with two 25 H. P. motors; two single truck cars, each equipped with two 25 H. P. Baxter motors; one car with two 15 H. P. Sprague motors, and 15 trailers.

Of the 22 miles of track there are 8 miles of 75-lb. Duplex rail, 8 miles of 75-lb. Tee rail, and 6 miles of Johnson girder rail.

The iron poles used along the line are of Morris Tasker & Co.'s make, wooden octagonal poles being used in the suburban districts.

There are forty miles of No. 0000 Washburn & Moen feeder wire. Messrs. J. G. White & Co., of New York city, are the contractors for all the track-laying and construction of the overhead equipment, etc., and the character of the work done by them reflects great credit on their work.

The railroad company will make a special feature of its Lake Roland terminus. At this point a park 15 acres in extent is being laid out, and will run around the lake, a distance of about 600 feet. Pavilions are being built and the park is being put in a condition that will make it a very attractive summer resort.

IRON POLES, LAKE ROLAND ELEVATED RAILWAY.

The maximum allowable speed of the cars will be 15 miles an hour, and there is every probability that the enterprise will be a paying one.

The officers of the company are: James L. McLane, president; Roland R. Conklin, vice-president and treasurer; Edward H. Bouton, secretary; Joseph P. Smith, general manager; L. N. Frederick, superintendent; Edward Van Gorder, chief engineer and electrician.

THE WESTINGHOUSE COMPANY AT THE WORLD'S FAIR.

The Westinghouse Electric and Manufacturing Co., Pittsburg, during the week beginning January 16, exhibited at its works in Allegheny City the dynamos now building for the lighting of the World's Fair, Chicago.

These machines are said to be the largest ever built for the generation of electricity for light and power, and, there being twelve of them having a maximum capacity of 15,000 16 C. P. lights each, they will, with the twelve 1,000 H. P. engines required to drive them, it is claimed, make the most extensive exhibit in the fair, and in fact the largest single exhibit of machinery ever made at any exposition.

Six of these engines will be driven by Westinghouse Machine Company engines having their shafts connected directly to those of the generators, and six will be belt-driven by engines supplied by other exhibitors.

The weight of each machine is approximately 150,000 lbs., and the armature, the largest single complete piece of each machine, weighs about 42,000 lbs.

The new stopper incandescent electric lamps, the manufacture of which is now being carried on in Pittsburg, were also exhibited. These lamps are made in separable parts, so that the carbon burners may be renewed and the glass parts used repeatedly, thereby effecting a reduction of about one-half in the cost of lamps and their renewals.

The company will, in addition to the above, have a very extensive exhibit in Electricity Hall, illustrating high-tension long-distance power transmission, and the many forms of generators and motors made by it. The power for the operation of this exhibit will be taken from the large generators above referred to, which have been especially designed to give double currents (now generally called multiphase currents) for the operation of Tesla motors as well as for lighting. There will be in this exhibit many illustrations of recent advances in generating and using electricity, with illustrations of some especially interesting scientific phenomena.

The new stopper incandescent lamps, now being manufactured by this company, will be exclusively used. At least 92,000 of these lamps will be required by the time the exhibition opens, and it is anticipated that the requirements of exhibitors will increase the number to 130,000 or more. Allowing an average life of six hundred hours for each lamp there will be required for daily renewals fully one thousand new lamps. The company proposes, if it can secure the needed space, to make as part of its exhibit a model lamp factory where it will produce new lamps and renew the carbon burners of those burned out, thereby making a most interesting and instructive exhibit, and at the same time effecting a saving in the cost of lamp renewals.

The following particulars relating to the company's business may prove interesting. The company has three factories in operation: one on Garrison alley, Pittsburg; a second (the old air-brake works) in Allegheny and the third in Newark, N. J. There are employed to-day 2,615 operatives in Pittsburg and Allegheny and 485 in Newark. With the spare room and new tools now in these factories there can be employed about one thousand more men.

The present output of all these factories aggregates $575,000 per month, and this can, with present facilities, be increased to about $800,000 per month to meet demands.

The machinery now erected is sufficient in size to make generators of 5,000 horse-power capacity, such as are now wanted by the Niagara Cataract Construction Company.

As customers of the company there are now 604 central lighting stations, 2,300 isolated lighting plants, and 200 electric street railways using its apparatus; and among these railways are the leading ones of the large cities, notably in New York, Philadelphia, Brooklyn, Chicago, St. Louis, Cincinnati, Cleveland, Pittsburg, Rochester and Albany.

The company can now readily turn out 200 motors each week, or sufficient for 5,000 cars per annum, each car usually having two motors for its operation.

JACKS.

One of the most essential pieces of machinery in a fitting or repair shop of an electric railroad or electric-light station is a jack. Heavy pieces of machinery and other bodies are constantly being handled and have to be lifted, and the question as to how this can easiest be done becomes an important one.

We give herewith views of various types of hydraulic, screw, and lever jacks manufactured by Watson & Stillman, proprietors of the "W. & S." Hydraulic Machinery Works, 204–210 East 43d street, New York city, with descriptions of the same.

Fig. 1 shows a "journal-box" hydraulic jack of the "low" type. They are made in three styles—the "plain," "base" and "low." The height of the "low" jack is 11 inches, and it has about 6 inches of lift. As its name implies, it is designed to raise journal-boxes of cars.

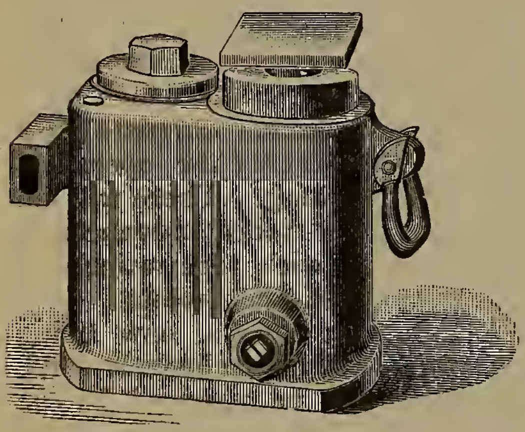


FIG. 1.

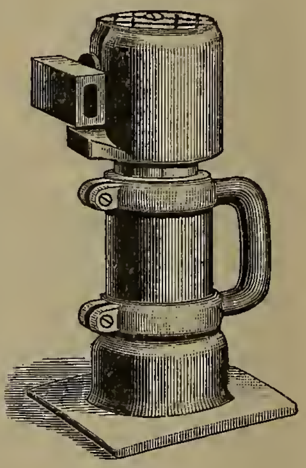


FIG. 2.

Fig. 2 represents a journal-box hydraulic jack of the "base" type. It has a good-sized malleable-iron bottom and is very light and convenient, and answers every purpose if a lift of not more than 3 inches is required.

Fig. 3 gives an illustration of the electric-motor lift made by this company. It is designed for lowering the motors from underneath the cars, and when the car is out of the way, raising it to the floor level. It has a single-plunger pump with power of four tons and a movement of three feet. It is reliable in action and is easily handled and worked. Its advantages are being rapidly appreciated among electric-railway companies. A small four-wheel truck rests on the head of the ram, which permits the operator to roll the motor off on the floor to any part of the shop.

The patent portable double-screw hoist is shown in Fig. 4. These hoists have guides for both hand and lifting chains, thus insuring freedom from riding of the chain or slipping, caused by twisting. The strain is taken upon right and left screws, which obviates the necessity for a thrust-block for the screw. They can be used in any position from vertical to horizontal.

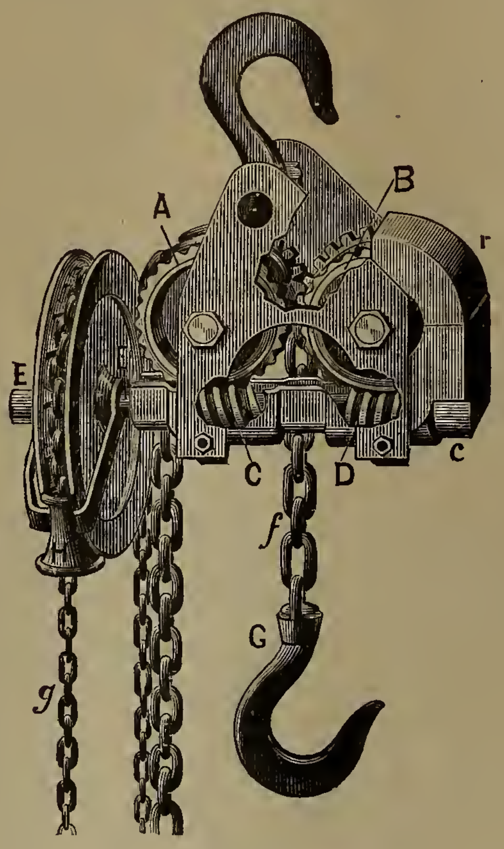


FIG. 4.

Fig. 5 shows a quick-lift traverse screw-jack. It is 27 inches in height, with a 10-inch lift, and the traverse is 13 inches; it weighs 150 lbs.

This company claims to have had the largest experience in the manufacture of hydraulic jacks, and guarantees these goods to be better made and give better satisfaction than any others.

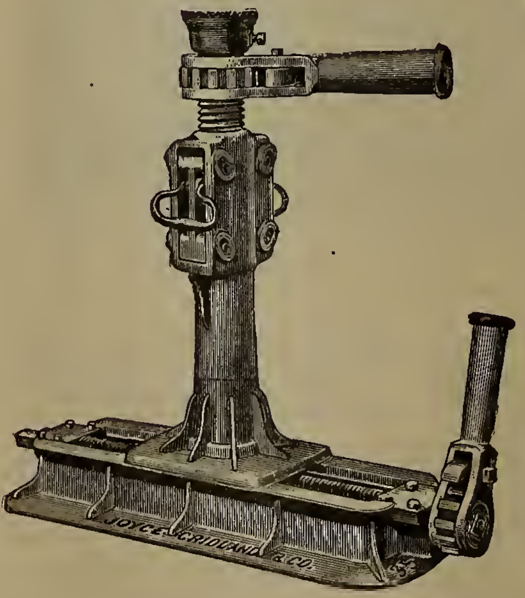

JOYCE CRIDLAND & CO.

FIG. 5.

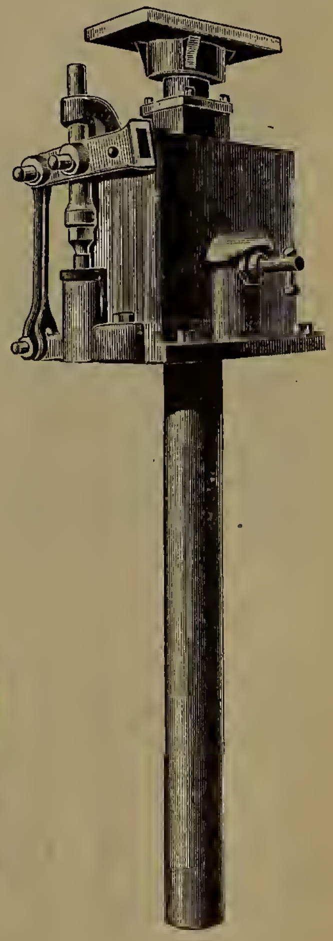
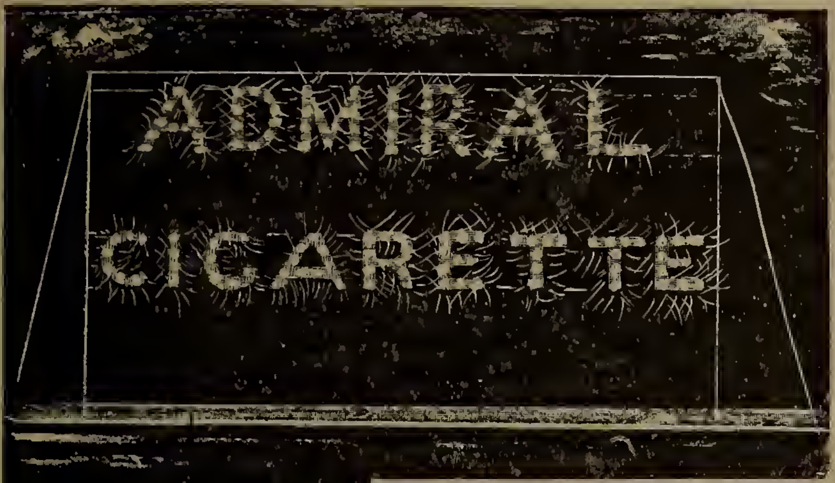


FIG. 3.



AT the junction of Broadway and Fifth avenue, New York, an electrically illuminated sign on the roof of the Madison Square Bank attracts a great deal of attention every night. In emblazoned letters stand out against the darkness of the night with startling boldness the words "Admiral Cigarette," as illustrated at the head of this column.

The letters are fixed to a light frame and are 50 feet above the roof. The sign is 60 feet long and requires a total of 378 16 C. P. lamps for all the letters. The main feeders are run from the cellar of the building, the distance to the lamps being 200 feet. The Edison street current and Grimshaw wire are used. The letters of the sign are 7 feet high and each one is fitted with two separate cut-outs, accessible by a scaffold behind the sign.

The contract was closed for the sign by Zimdars & Hunt, 127 Fifth avenue, New York, at 9 A.M. on the second Saturday before last Christmas, and was completed in time to turn on the current on the following Saturday. The thing worked beautifully from the start, not the least hitch occurring to mar the success of the undertaking. The sign has been operated every night since and is a conspicuous object at night. It can be seen and read for several miles around the locality.

Two circuits are run to the lamps forming the letters so that in case of trouble on one circuit the lamps on the other suffice to maintain the illumination. The lamps are provided with waterproof connections, so that the condition of the weather has no effect whatever on the illumination. The plant is installed on the 3-wire system.

This unique plant reflects great credit upon the excellent manner in which Messrs. Zimdars & Hunt do things. Their business is that of electrical engineering and contractors for all kinds of electrical plants, including construction and wiring, and they possess rare skill in their line.

ANOTHER INCANDESCENT LAMP.

It is reported that a company has been formed for the purpose of manufacturing a new patent incandescent lamp, the invention of Mr. Philip K. Stern, of Buffalo, N. Y. It proposes to erect a large factory near Buffalo.

Mr. Stern claims that this lamp is not an infringement of the Edison patent, and, in substance, describes it as follows: The carbon filament within the glass bulb is covered entirely with a pure glass case. This is to prevent the loss of the carbon particles, which is the cause of the wearing out of the Edison lamp. There is no vacuum; instead, the air is used to prevent the expansion of the glass when it is heated. This lamp is designed and constructed on the idea of durability.

ELECTRIC HEATING.

BY G. EMIL HESSE.

Every new departure tending to widen the usefulness of electricity is generally well received by the public, and soon we find manufacturers taking up the new idea and new factories started for the purpose of carrying it into practical effect. Very often this is also done without the slightest regard for the rights of the original owner and patentee. A vacuum is created which has to be filled, and it is filled because there are always men willing to make money. That rule does not apply to this case alone, but to every invention supposed to be of value.

We use the electric current to-day both for cooking and heating purposes, the latter now coming into use to a large extent in electric cars. I had a conversation a few days ago with a well-known car-builder, and he complained that the electric heater was not satisfactory, having a very low efficiency, and asked me to take the thing under consideration.

I found, of course, that it is a very uneconomical way of utilizing the heat stored in the coal, but there are so many distinct advantages connected with the electric heater in a moving vehicle that we can well afford to place the question of economy in the background. As to the idea advanced by said car-builder, to design a heater with a higher efficiency, the following figures will show what an electric current can do:

Suppose that we use 5 kilowatts per car, which represents per second $A^2 \times R \times 0.000238$ thermal units. We have therefore with $A = 10$ ampères and $R = 50$ ohms:

$$10^2 \times 50 \times 0.000238 = 1.19 \text{ T. U.}$$

Suppose, further, that we have a volume of air to be heated = 30 cubic meter, and the desired rise in temperature = 20° centigrade, then we find that this represents:

$$30 \times 1.294 \times 20 \times 0.2375 = 184.4 \text{ T. U.}$$

It takes, therefore, theoretically,

$$\frac{184.4}{1.19 \times 60} = 2.6 \text{ minutes}$$

to heat the car to said temperature. Practically it takes about fifteen minutes, and even longer, thus showing an efficiency for car and heater of 17.33 per cent., which of course is not very favorable. The fault is not entirely with the heater, the greatest loss being due to the exposed surface that the car presents to the cold atmosphere. The slightest movement of the air accelerates the cooling of the car, and this deficiency has to be made up by the heater. There is no doubt that the heater could be improved upon, and I regret that I have not had the opportunity to make a practical test of its efficiency. That the electric heater cannot compete with steam in buildings or steam cars is obvious, as that mode of heating is one of the most efficient and at the same time cleanest in operation. We find that the difference is considerable when we compare the two systems; this being due, in one case, to the additional processes necessary in converting the steam first to power, second to electricity, and consequent loss in transmission to car, and third to heat.

The best triple-expansion steam-engine has an efficiency of 14 per cent., the dynamo 90 per cent., the loss on the line varies with the length, etc., but 50 per cent. will be a good average, and the heater 34 per cent. more. Therefore, dividing the losses with the car, the actual efficiency of the electric heater is

$$0.14 \times 0.9 \times 0.5 \times 0.34 = 0.0214,$$

or a little over 2 per cent.

If we, on the other hand, analyze steam heat, we will find that it shows a decided superiority with regard to economy. One kilogram of ordinary good coal will evaporate 8 kgr. water=$8 \times 537 = 4296$ T. U., which is turned back to heat when condensed. One kgr. coal is equal to 7500 T. U. The efficiency is therefore,

$$\frac{4296}{7500} = 0.572,$$

or over 57 per cent., and allowing 15 per cent. for losses in transmission, etc., we get the real efficiency :

$$0.57 - 0.15 \times 0.57 = 0.485,$$

or a little over 48 per cent. There is in many cases more than a 15 per cent. loss, due to incomplete condensation of the steam, but there is such a large margin to draw upon that it is impossible for the electric heater to compete with steam when economy is desired.

The question is changed considerably when we compare the electric heater with the stove. It has to be a very good stove, of the type carried in the street cars, to have an actual efficiency of 5 per cent., and the electric heater, with its 2 per cent. efficiency, combined with its cleanliness and convenience, compares very favorably with its only rival.

A good thing is very often spoiled by claiming too much for it and trying to compete where no competition is possible.

THE BLAKE TRANSMITTER.

EXPIRATION OF PATENTS.

According to law, the right to make, use and sell that part of the telephone apparatus known as the "Blake Transmitter" ceased to be exclusive with the Bell Telephone Company at midnight January 20, 1893.

At that time all the rights were turned over to the public, and now any one who chooses may make these instruments and do what he pleases with them.

The Blake transmitter was covered by four United States patents, viz.: No's. 250,126, 250,127, 250,128 and 250,129, the applications for the first three being filed on September 15, 1881, and that for the last one on October 31 the same year. All the patents were allowed and issued on November 29, 1881. Patents were also taken out in England on the same inventions on January 20, 1879, nearly three years prior to the date on which the American patents were issued, and they had the effect of limiting the life of the American patents to the term for which English patents are granted, namely, fourteen years. By a little calculation it will be seen that in this case the term of the American patents was cut short nearly six years ; and it will also be seen that the life of the American patents was even shorter than that of the English, for the reason that the latter were issued nearly three years earlier than the former, the net result being patent protection in the United States for only a little more than eleven years.

On January 20, 1893, the English patents expired, and, according to the United States patent laws, the American patents died with them. This date was fourteen years after that on which the British patents were granted and a little over eleven years after the granting of the American patents.

The next expiring telephone patent in the United States will be on the Bell receiver, and will occur on March 7, 1893.

In view of the situation a description of the Blake transmitter will be of interest at this time.

The Blake transmitter gets its name from its inventor, Mr. Francis Blake, of Massachusetts, and is used by the Bell Telephone Company on all the telephones throughout the United States. It is one of the two most important parts of the telephone of to-day, and it is due to it in a great measure that the telephone is the practically successful instrument that we find it, and while other forms of transmitters were good, none of them equalled the Blake instrument. In order that our readers may better understand its construction and operation we give herewith two illustrations showing a cross-sectional view and an internal view of the box containing the transmitter and its accessories. The transmitter itself is entirely attached to the door of the box, the apparatus inside consisting of the induction coil and its connections. On the telephone-board the transmitter occupies a position between the magneto call-bell and the battery-box and is distinguished by the round opening on the front side of the box.

In cross-sectional view, Fig. 1, *a* represents this opening or mouth-piece. Immediately back of it is fixed a sheet-iron diaphragm *e* (shown in both illustrations), which is supported by a soft rubber ring *u*, and the springs *v* and *v′*—the springs being shown in Fig. 2 only. The spring *v′* presses on the ring and spring *v* on the diaphragm itself, a piece of felt being placed between the spring and the diaphragm. The object of the rubber ring is to insulate the diaphragm from the conductors, both mechanically and electrically, and the piece of felt between the spring *v* and the back of the diaphragm is to keep the latter from vibrating to excess The iron ring *r r r r* (Fig. 2) has two projections *b b* (Figs. 1 and 2) about three-fourths of an inch in length, from the upper one of which a bar of iron of peculiar shape, *c*, is suspended by a brass spring *m*. A flat metal spring *g*,

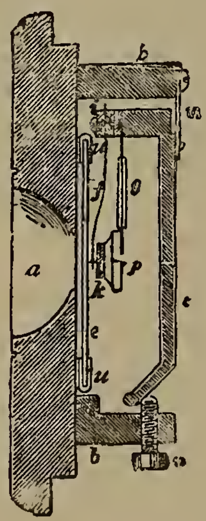


FIG. I.

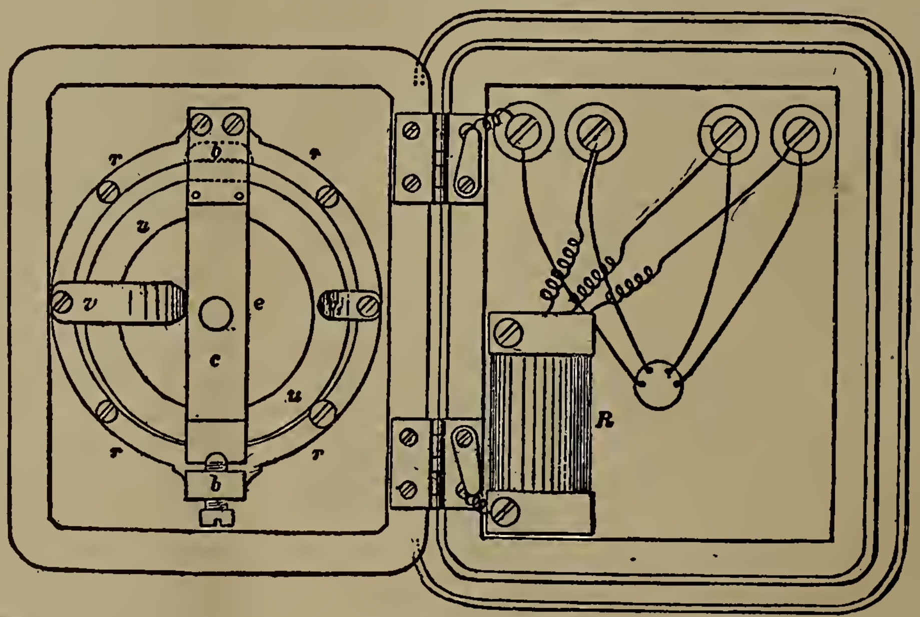


FIG. 2.

attached to the short upper arm of *c*, and enclosed in soft rubber to lessen its vibration, carries at its lower end a brass disc *p*, to which is attached a carbon-button, or disc, *k* (Fig. 1), both suspended opposite the centre of the diaphragm *e*. A thin, flexible steel spring, *f*, insulated from *g* by the block of vulcanized fibre, *i*, is also attached to the upper arm of *c*, its lower end having two platinum points, one of which makes contact with the centre of the plate *k* and the other with that of the diaphragm *e*. The tension of the springs *f* and *g*, and hence the pressure of the various contacts between the discs, is adjusted by the screw *n* by means of its bearing against the lower bent arm of *c*. So much for the Blake transmitter.

Its connections and relation with the system will now be explained. In the lower box is contained one cell of Lelanché's battery, which supplies the current necessary for the operation of the transmitter. One wire from the battery connects with the primary circuit of the induction coil *R* (Fig. 2), thence with one of the door-hinges, thence to the ring *r r r r*, to the upper projection *b*, upper arm of *c*, springs *m* and *g*, plates *p* and *k*, platinum point, spring *f*, through a lever in the upper compartment or box (in which the magneto is located), and thence through the other door-hinge to the opposite pole of the battery. The secondary circuit of the coil *R* is connected with the line and the earth by its opposite terminals.

The lever referred to is used to open and close the primary circuit, and it terminates in the familiar forked hook on the outside of the magneto-box, which hook supports the receiver. The weight of the receiver keeps the lever down, thus keeping the primary circuit open, and preventing exhaustion of the battery by the generation of current when it is not required.

The operation of the transmitter is based on the fact of the variation of the current strength by the variation of the pressure on the carbon-button, the pressure being rapidly changed by the impact of the sound-waves on the diaphragm. These variations are remarkable for the amazing rapidity with which they occur, being about 400,000 a minute. It is one of the remarkable and unique properties of carbon that its electrical resistance varies directly as the pressure upon it, and it is on this principle that the Blake transmitter is based. The compression on the carbon-button, and consequently the electrical resistance in the primary circuit, is constantly changing under the influence of the voice on the diaphragm, and with each change a current in one direction or the other is propagated in the secondary coil by current induction, which current is conveyed by the line wire to affect the receiver at the distant end. The function of the induction coil is, to state the fact briefly, to give to the current greater power to overcome the resistance of the line wire, so that it will possess sufficient strength to act on the receiver at the opposite end.

INJUNCTION DENIED TO THE GENERAL ELECTRIC COMPANY.

Judge Colt, of the United States Circuit Court at Boston, Mass., has refused to grant a temporary injunction applied for by the General Electric Company in their case against the Beacon Vacuum Pump and Electrical Company. This refusal is a serious set-back to the plans of the General Electric Company in shutting up all the factories throughout the country on the ground of infringing the Edison incandescent lamp patent.

The defence of the Beacon Company was based upon the fact that a German by the name of Heinrich Goebel had, prior to the breaking out of the Rebellion, manufactured and experimented on an incandescent lamp almost identical in construction with that of the Edison patent. From the affidavit of Mr. Goebel, presented to the court on the part of the defendants, it appears that the deponent had carried out and experimented along the line of suggestions which he had received while he was connected with Prof. Moenighausen in Germany In the early fifties it appears that he attempted to carry out some of these ideas, and constructed a number of lamps from glass tubing, using for filaments carbonized bamboo, and also carbonized tampico, flax and species of grass. These filaments were attached to platinum, sometimes iron or copper, and sealed air-tight into the tube by fusion. The air was then removed from the tube by means of mercury, and the lamp was hermetically sealed by fusion. The filaments used by Goebel were of different shapes. One was like a fiddle-bow, another like a hairpin, and a third spiral or twisted.

Mr. Goebel made no secret of these lamps, and often used them to light up his little watch-repairing establishment, as he was by trade a watchmaker and optician. He used them at times in the streets of New York city on a wagon; also exhibiting a large telescope, charging a small fee to look through it. He used the lamps partly to give light and partly to attract attention.

He considered his lamp a mere toy, and did not think that his invention was of any commercial value. This, with the fact that he could not read or speak English to any extent, therefore not knowing what was going on in the world outside of his own circle of friends, explains why he has never asserted a claim to his wonderful invention. The affidavit of Mr. Goebel is supported by about twenty-five or thirty others, none of which have any substantial variance.

The fact of the refusal to grant the temporary injunction indicates that there will be a lively time when the case is finally tried for a permanent injunction. The court has allowed a week for the filing of briefs.

Mr. S. B. Eaton, lawyer for the General Electric Company, is reported as having said, in effect, that the invention of Henry Goebel and his claim to anticipate Mr. Edison was brought to the company's notice as early as May, 1882. Mr. Goebel wanted the Edison Company to buy what he had, but it was decided not to do so by the board of directors. What Goebel had was absolutely worthless. All this appears in the minute-book of the Edison Company and in Mr. Eaton's personal diary, in and about the month of May, 1882. Mr. Eaton's understanding is that the prominent patent lawyer who then acted for Goebel took the same view of the subject that the Edison Company did and dropped it.

In speaking of the Beacon Company case Mr. Eaton asserted that this is an old matter which is now revived only for the purpose of delay and to prevent the court from immediately shutting up the lamp factory of the defendant.

STORAGE BATTERIES IN ELECTRIC-LIGHT STATIONS.

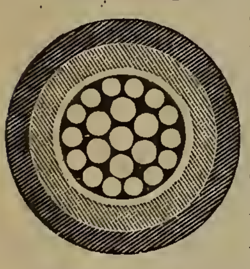
The annual report of R. R. Bowker, first vice-president of the Edison Electric Illuminating Company of New York, is a very complete one, and full of interesting matter. In regard to the experiments now in progress by the company with a view to determining the commercial value of storage-battery installations as auxiliaries to regular dynamo plants, Mr. Bowker says:

"The general use of storage batteries in connection with station work in England, France and Germany, as seen during my investigations abroad, made it seem advisable to experiment with a storage battery of a type in successful operation in England, which would not be complicated with the legal questions involved in the batteries hitherto known in this country. Arrangements were therefore made with the Crompton-Howell Storage

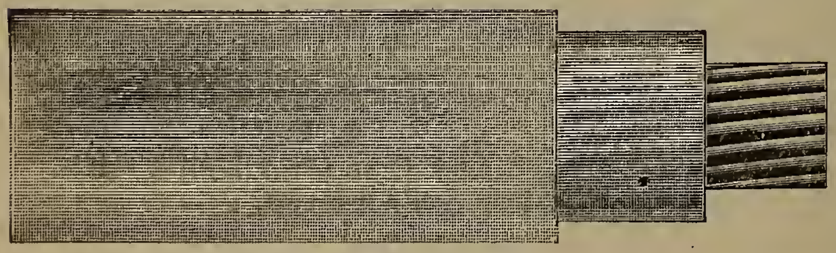
Battery Company, Limited, of London, to install in a portion of our new 53d street station, arranged for that purpurpose, a storage battery of 2,000 ampère-hours' capacity, on which guarantees of 85 per cent. efficiency in ampère output and other guarantees were obtained. This battery is now installed at that station and will presently be working as a part of our operating system, and its results during the experimental period of six months will throw much light on a problem of very large importance to this company as well as to other Edison low-tension direct-current systems throughout the country. After this battery has been in operation for a sufficient period to demonstrate its advantages and disadvantages on this company's system, it is intended that the general operating superintendent shall give attention while abroad to the actual workings and economies of the storage batteries of the various types in use in England and on the continent. It is still an open question whether a storage-battery plant, which costs in round numbers about twice as much as a generating plant of an hourly capacity equalling the total charge capacity of the battery, can be economically utilized on a system so large as that of this company, requiring continuous operation in at least two of its stations throughout the twenty-four hours. On the other hand, the storage battery, with the addition of a 'booster' or motor dynamo for automatically raising voltage, developed by Mr. Barstow of the Brooklyn Edison Company, should be of considerable use to this company in developing remote districts not yet ready for station equipment, if not for increasing the economy and efficiency of the dynamo plant, and will most certainly be found of use in connection with smaller Edison plants whose minimum load is so small as to permit of the use of a storage battery to replace one labor shift."

INSULATED ELECTRIC-LIGHT CABLE.

The Bishop Gutta Percha Co., 420 to 426 East 25th street, New York city, is making for the United States Electric Light Co., Washington, D. C., four miles of 000 white core rubber cable in addition to that already in use by the United States company. The cable is encased in lead protected by heavy braid saturated with special anti-gasp compound. This compound is a sure preventive of the injurious effects on cables of gas, which is present in a greater or less degree under city streets.



The Bishop company's cables are renowned, and there is only one way to make a good reputation, and that is by making reliable goods.



NO. 000 WHITE CORE RUBBER CABLE.

The council of Hudson, Mich., has ordered that after February 1 the electric lights be turned off, there being no money in the treasury to pay running expenses.

J. B. Newcombe, of Scranton, Pa., has brought suit against the Thomson-Houston Electric Manufacturing Company for the recovery of a claim reported to be about $5,000. The suit is similiar to those brought by Messrs. Sturgess, Sanderson and others. Foreign attachments also were asked for.

WORLD'S FAIR NOTES.

Director-General Davis announces that of 3,642,812 square feet of space in the World's Fair buildings only 214,476 square feet remain to be assigned to exhibitors. He further says that it is always necessary to hold a certain area of space in reserve for first-class exhibitors who want to come in at the last moment rather than to give the space to inferior concerns simply because the latter forwarded their applications early.

	Total Area.	Foreign.	American.
Machinery....	456,661	129,002	204,771
Transportation	590,589	166,654	402,938
Manufactures.	790,942	428,670	215,927
Electricity ...	185,100	60,938	137,000

In the matter of the space already assigned to domestic exhibitors, the committee from the "International Exhibitors' Association" states that they were informed by the officials of the fair that in nearly every instance the space which had been allotted was from 30 % to 50 % less than the amount applied for, therefore it is expected that a large number, on receiving their allottment, will refuse to make an exhibit on account of the limited amount of space offered them, and that this space so rejected will then remain to be assigned to many intending exhibitors whose applications were received at a later date. It is expected, therefore, that many assignments will yet be made as soon as the officials of the fair are able to re-allot the space rejected.

Mr. J. Allan Hornsby, secretary, Department of Electricity, World's Fair, has sent out a circular letter to intending exhibitors in that department. In effect the letter states that only the company signing an application for space will be permitted to utilize the space assigned to it. It is against the rules for any exhibitor to display the goods of any other concern, unless space for the same has been properly secured. The communication is especially applicable to supply-houses, and immediate attention to the matter is requested in order to secure proper representation in the official catalogue. Full instructions are given by Mr. Hornsby as to how to proceed to comply with the rules.

AN INTERESTING MEETING.

On February 8, at 8 p.m., the New York Electrical Society will hold a meeting at Columbia College, Madison ave. and 49th st., which will be of unusual interest. The subject of the lecture to be delivered will be "The Telephone, and How We Talk from New York to Chicago." The lecture will be divided into two parts, the first being on the nature of sound and the mechanism of speech, by Mr. J. J. Carty, and the second descriptive of telephone lines in use prior to the opening of the Chicago line, by F. A. Pickernell. The New York-Chicago line will be placed at the disposal of the members and telephone receivers will be distributed throughout the room.

Members are at liberty to bring ladies. The occasion promises to be a most interesting one.

The smoke-stack of the electric-light station at Bucksport, Me., was blown out of position in a recent gale and has since fallen to the ground. The fall damaged it so badly that it is worthless, and the company has ordered a new one.

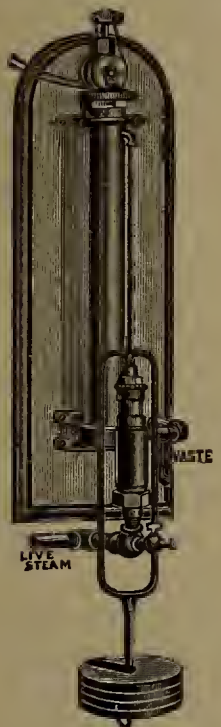
Meters will be put in by the electric-light company at Greenfield, Mass., and hereafter the light will be sold by measurement instead of by the year.

On January 19 an explosion of sewer gas wrecked one of the buildings of the Equitable Gas and Electric Light Co., Utica, N. Y.

AUTOMATIC DAMPER REGULATOR.

The accompanying illustration shows an automatic damper regulator just brought out and put upon the market by G. M. Davis & Co., Chicago.

It is so designed and constructed that it will operate a damper of any size at a variation of one pound pressure in the boiler. It has only one connection with the boiler, and has no diaphragms, springs or packing. It is claimed that it effects a saving of from 7 to 15 per cent. of fuel, which is a feature of great importance.



It is neatly constructed and is an ornament to any engine-room.

In operation the valve is weighted to whatever pressure desired, the normal position of the damper being open—held open by a weight on arm. When pressure in boiler arrives at the set point the valve is forced up, opening steam ports and admitting steam at boiler pressure under piston inside of cylinder, forcing it up and closing the damper by means of the cord or chain run from end of piston-rod under the pulleys and connected to the damper-arm. This position is maintained until pressure falls one pound, when the weights bring the valve down, closing the live steam ports and opening exhaust ports. The pressure being taken off the piston, it is pulled down by the weight on the damper-arm, the steam in cylinder under piston being exhausted through the exhaust ports into the waste-pipe, which can be run into ash-pit or other convenient place. The amount of condensation passed by waste-pipe will seldom exceed a pint in every twenty-four hours.

Only one size of the regulator is made, and that answers for all conditions.

The New York office of the firm is at 136 Liberty street.

TELEGRAPH DEPARTMENT.

THERE is trouble between the Order of Railway Telegraphers and the Wabash railroad system. The operators assert that the railroad company is endeavoring to weed out the union men and dismiss them.

TEN Western Union linemen were arrested a few days ago in Washington, Pa., for Sunday desecration, in moving some telegraph poles on that day. Each was fined $4 and costs. The company will appeal the case.

THE Western Union Telegraph Company is about to install a dynamo plant in its Buffalo office to generate the current for telegraphic purposes.

NOTES OF GENERAL INTEREST.

THE *Street Railway Review*, Chicago, has moved to larger quarters at 265 Dearborn street.

A CONTRACT has been awarded furnishing electric lights for Webb City, Mo., at $8.50 for each light.

THE city council of Kalamazoo, Mich., is considering the feasibility of building and maintaining its own electric-light plant.

THE electric lighting service of Wickford, R. I., has been discontinued on account of the inability to secure sufficient water-power.

A PETITION has been presented for the consolidation of the electric-light companies in Rockland, Me., and the surrounding towns.

THE insurance adjusters have fixed the loss at $32,600 which the electric-light works of Fort Wayne, Ind., recently sustained by fire.

A PROPOSITION to put an electric plant for one thousand lights in the court-house, Indianapolis, Ind., has been submitted by the Western Electric Company of Chicago.

A FORCE of surveyors, it is reported, is at work laying out the branch route of the Chicago and St. Louis Electric Railway, which is to connect Springfield, Ill., with the main line at Edinburg.

ON January 17 the works of the Tiffin Edison Electric Light Company, Tiffin, O., including the incomplete plant being erected, were destroyed by fire. Loss, $30,000, partially covered by insurance.

REPRESENTATIVE HOAR has introduced in the Massachusetts House a bill providing for the placing of electrical conductors underground in cities of the State of 300,000 inhabitants or more, also for an electric subway commission.

MR. CHARLES STEINER read a paper before the Engineer's Club of Minneapolis, Minn., in which he presents what seems to be a feasible plan of utilizing the power of the falls without naturally marring the picturesqueness of the same.

THE Augusta, Hallowell and Gardiner Railroad Company will ask the Maine legislature to allow an amendment to its charter authorizing the company to supply light, heat and power to the three cities. Also to extend its tracks in Gardiner.

A SYNDICATE has purchased the Alton Street Railway system, Alton, Ill., and the new company will be incorporated under the name of the Alton Electric Street Railway Company; it will equip the railway with electric motive-power and furnish electric lights for individuals.

THE city of Marshall, Mich., has purchased the splendid water-power at that point and is installing an electric lighting plant, which is to be of the most improved construction and will be used for public lighting purposes. Power will be rented to manufacturers for use during the day. This will prove an economical arrangement both for the city and those seeking cheap and reliable power.

RAPID TRANSIT IN NEW YORK CITY.

The Manhattan Elevated Railway Company has asked the Rapid-Transit Commissioners for permission to extend its tracks in accordance with the resolutions passed by the board a short time ago, and given in full in this paper last week. The most important proposal is for a road up Seventh avenue to Forty-fourth street, and thence along Broadway, the Boulevard and Eleventh avenue to Fort George. On the east side an extension to Fordham is contemplated.

The company is not inclined to extend its roads to places not wholly built up, but prefers to stop at a point short of the northern boundary, where the average of profit will not be affected by operating in a thinly populated territory. This feature of the proposed plans, together with the road on Broadway and the Boulevard, will undoubtedly meet with serious opposition.

When the plans of this company were presented several spoke against them and a number advocated the construction of the underground system at public expense. Mayor Gilroy is opposed to the city building or operating any of the roads, underground, surface or elevated. He says that he believes that it is the proper function of a city to provide actual necessaries of life, as gas and water, but he draws the line at building railroads.

The commissioners, after the receipt of the petition of the Manhattan Elevated Road, replied with a letter stating in effect that they did not understand that the application was in compliance with the condition that a "single maximum fare of five cents" be charged within the city limits. It is generally understood that the company will make this clear in accordance with the conditions imposed.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Alton, Ill.—A. M. Farnum, representing a syndicate, has closed a deal for the purchase of the Alton street railway, which it will equip with electricity, and also construct a new line from the City Hall building to North Alton. The new company will also furnish electric light and gas for the city.

Bangor, Me. — The proposition of lighting the State institutions by electricity is being considered.

Columbia, S. C.—The residents here want the lighting facilities of the city improved.

Gardiner, Me. — The Augusta, Hallowell and Gardiner Railroad Company will establish a light and power station for lighting and supplying power to each of the cities along its route.

Gloversville, N. Y.—The Gloversville Electric Light Company is going to increase the facilities of its plant by erecting a new building 25 x 50 feet.

Hudson, Mass.—The Hudson Electric Lighting Company wishes to do a larger business and is looking for better facilities.

There is a project on foot to establish a plant here for the manufacturing of electric lamps. Edward Heyman, president of the Boston signal patrol system is interested.

Niagara Falls, N. Y.—The new office building being erected by Mr. A. H. Gluck, in this place will have its own electric-light plant. This is one of the finest office buildings in western New York.

Rochester, N. Y.—Michaels, Stern & Co., clothing manufacturers, are about to construct a large seven-story building, which will be lighted throughout by electricity.

St. Anne, Ill.—Capital to start an electric-light plant is wanted in this place.

Windsor Locks, Conn.—The Windsor Locks Electric Light Company is to build an addition to its plant and put in a new dynamo of 1,000 lamps capacity.

NEW CORPORATIONS.

Buffalo, N. Y.—The Buffalo Electrical Construction Company, Mr. H. V. Ford, Supt., has been incorporated. It has opened an office in the new Laird building, Niagara street, Buffalo. Mr. Ford was formerly connected with the Edison Company and is a thorough and practical electrician.

Cloquet, Minn.—The Cloquet Electric Light and Power Company. Capital stock, $50,000. Incorporators: W. P. Allen, A. M. Sheldon, A. Peterson, J. E. Lynde and F. B. Poole.

Colorado Springs, Col. — Interstate Electric Light and Power Company. Capital, $100,000.

Duluth, Minn. — The Commercial Light and Power Company has been incorporated with a capital of $500,000 to furnish electricity for light and power purposes. Incorporators: Morgan Brooks, of St. Paul; Franklin Paine and G. A. Leland, Duluth.

Hartford, Conn.—A petition has been introduced in the Connecticut House for the incorporation of the People's Light and Power Co.

Manchester, Conn.—N. T. Pulsifer and others are the incorporators of the Manchester Light and Power Company. Mr. Wood of this place is also interested.

Niagara Falls, N. Y.—The Power City Illuminating Company was incorporated January 19 for the purpose of furnishing electric light. W. B. Rankin, New York; P. A. Porter, Niagara Falls; H. L. Brewster, Rochester; A. Erickson Perkins, Rochester; Haywood Hawks, Rochester; and L. A. Boore, Niagara Falls, are interested. Mr. Boore is secretary of the company. Power is to be obtained from the tunnel.

Orrville, O.—The Orrville Light, Heat and Power Company. Capital, $20,000.

Pueblo, Col.—Central Colorado Electric Supply and Manufacturing Company. Capital, $100,000.

Wallingford, Conn.—The Wallingford Electric Light, Power and Tramway Company has been incorporated by Hugh L. Mallen and others. Mr. Roach, of this city is also interested.

Westport, Conn.—The Electric Light and Power Company. Incorporators: John L. Jones and others. Mr. Hicks, of Tolland, is interested.

Washington, Pa.—S. B. Ewing has been elected president of the street-railway company and Mr. Parish, of Pittsburg, superintendent.

NEW ELECTRIC ROADS.

Akron, O.—It is expected that the work of building the Akron and Silver Lake Electric Railway will be commenced in the near future.

Alexandria, Ind.—A franchise has been granted for an electric street railway here.

Athol, Mass.—An electric road to run from the fair grounds to Orange is a possibility of the near future.

Columbus, O.—Mr. Dodge advocates the building of an electric road on the canal tow, to be operated by the board of public works.

Conshohocken, Pa.—The Norristown and Conshohocken Passenger Railway Company has asked the council for the privilege of using certain streets to construct and operate a street railway.

Cumberland, Md.—The Lonaconing and Cumberland Railroad and Power Company will build its new road from this place to Westernport. The overhead trolley system will be used.

Dedham, Mass.—The Norfolk Suburban Street Railway Company has petitioned the selectmen for permission to construct and operate an electric road on certain streets here.

Edge Moor, Del.—The Wilmington and Brandywine Springs Electric Railway Company proposes to construct and operate an electric road from this place to Brandywine Springs. Robert C. Justis and Dr. L. H. Ball are interested in the project.

Evanston, Ill.—The Chicago North Shore Railway Company has asked for a franchise for constructing and operating a street railroad from South Evanston to this place.

Fiskdale, Mass.—The people of this town want an electric road between here and Southbridge.

Worcester, Mass.—The Worcester Consolidated Street Railway Company has asked for permission to extend its lines.

NEW YORK NOTES.

Office of The Electrical Age,
First Floor, World Building,
New York, January 28, 1893.

During my calls about the city the past week I noticed that the gloom of the malarial fogs seemed to have settled down upon the minds of the people, but the warm sunshine which came over the city later in the week dispelled the fogs and gloomy feelings and awakened a new interest in affairs. Trade and commerce began to show activity, and orders came piling in to our large supply-houses as dew falls from the grass under the effect of the morning zephyrs.

W. W. Tupper & Co., manufacturers of patent grates, have moved their offices from 206 West street to Room 131 Taylor building, 39 and 41 Cortlandt street, city.

A claim against New York city for $1,250 has been filed by the Metropolitan Telegraph and Telephone Company for telephonic services rendered to the board of excise during April, 1889.

"General Jim Godfrey," of Grimshaw Insulated Wire fame, was seen going to Brooklyn one day this week. There must be something big in magnetic wire to draw him to the "City of Churches."

The A. B. C. Company, 18–20 Cortlandt street, is constantly adding new varieties of electrical specialties. Mr. Chalmers is as genial as ever, and Mr. O'Reilly, the manager, is still guiding the firm in the channels of success.

The Edison Manufacturing Company, 110 East 23d street, has been very successful with its Edison Surgical and Dental Battery Motor outfit. Dr. Graves, of Brooklyn, using one of these outfits for some time, has met with excellent success. The writer, speaking from experience, can testify to the easy operation of the dental outfit.

Mr. George B. Prescott, Jr., the well-known electrician, is in Bellevue Hospital insane. He arrived in this city a few days ago from Bermuda, and his condition was such that he was confined to his state-room during the voyage. On arrival here he became violent and was removed to the hospital. Mr. Prescott resides in Pittsfield, Mass.

A test will shortly be made of Woods' system of underground conductor railway. Several well-known capitalists are interested in it, and they are now preparing to try the system. A new method of insulation has been devised by Mr. Woods which is claimed to be a very important feature of the perfected system. We will give a full description of the test after it has been made.

The electric-light and power station between Hunter's Point and Blissville, L. I., in which Patrick J. Gleason, Long Island City's pugnacious ex-mayor is actively interested, was compelled to shut down a few days ago on account of the water supply being cut off. It was suspected that the supply of water was obtained from the street mains surreptitiously, so the water was shut off to settle the question with the result as above stated.

Meyrowitz Bros., 23d street near 4th avenue, are among the most advanced scientists in the optical and electrical lines. They have been adding many varieties of medical electrical apparatus, including complete electro-medical outfits to be used on 110-volt circuit, and giving Faradic or Galvanic currents, also an adapter to use with 16 C. P. lamps, and a Vetter resistance, which acts as a transformer. It can be used with an ordinary battery.

The John Stephenson Co., the old and well-known builder of electric street cars on 27th street, is as busy as ever trying to keep ahead of the orders for cars from places all over the country. This company is one of the most extensive of its kind in the United States, and John Stephenson cars are seen in almost every city in the land. Among the many large orders recently filled are included some for the Salt Lake City electric line and others for Washington and New York city.

Zimdars & Hunt, electrical and mechanical engineers, 127 Fifth avenue, manufacturers of all kinds of electrical and pneumatic devices, have an enviable reputation among electrical engineers. They contract for the complete installation of electric-light plants, and their wiring work is of an exceptional character. Their show-rooms are fitted out in the most attractive manner, and the practical application of the various apparatus dealt in by them is shown. In the show-window there is an attractive-looking motor and various electric fixtures of unique designs, which are connected up and lighted by the touch of a magic button.

The New York Electrical Equipment Co., since it acquired possession of the elegant electric-fixture department of the old Edison Company at 275 Fifth avenue, has remodelled the interior somewhat and added a larger line of electroliers and fixtures to the already large stock. In the basement is the contracting department. Here all the business pertaining to the complete equipment of central stations or isolated plants is carried on. The company's store-rooms and main offices are at the corner of Duane and Elm streets. It has just completed an immense factory on 33d street and First avenue, where the new arc lamps for low-tension circuits and other electrical apparatus are manufactured. W. T. H.

ELECTRICAL STOCK QUOTATIONS.

The following are the latest prices for electrical securities in New York, as quoted by Geo. B. Ellery, financial editor **Electrical Age.**

Names of Companies.	Capital.	Par.	Price.
American Dist. Tel., N. Y.	3,825,000	100 00	59 00
American Telegraph and Cable	14,000,000	100 00	87 00
American Visual Telegraph Co.	500,000	100 00	†75 00
Bell Telephone	17,000,000	100 00	212 00
Bell Telephone 7s	2,000,000		*113
Boston Electric Light Co	1,500,000	100 00	117 00
Brooklyn Edison Electric Light	1,500,000	100 00	113 00
Brooklyn Edison Electric Light, 5s	500 000		*100
Brooklyn Citizens' Electric Light	500,000	100 00	150 00
Brooklyn Municipal Light	500,000	10 00	17 00
Brush Elec. Lt. Co. pref., Balto	600,000	100 00	80 00
Brush Elec. Lt. Co., Balto., 5s	200,000		*105
Brush Elec. Ill., N. Y.	1,000,000	100 00	30 00
Brush Elec. Ill., 6s, N. Y.	300,000	100 00	*102
Brush Elec. Co., Parent		50 00	40 00
Brush-Swan E. L. Co. of N. E.	2,000,000	100 00	20 00
Burrell Electric Signal Co., N. Y.	500,000	20 00	10 00
Chattanooga Elec. Lt. Co., Tenn., 6s.	200,000		*101
Chattanooga Elec. Lt. Co., Tenn.	100,000	100 00	92 75
Chicago Gas	25,000,000	100 00	92 00
Columbia Chronophone Co., Phila.	500,000	25 00	35 00
Commercial Cable Co	7,716,000	100 00	174 50
Cons. Gas Co., N. Y.	35,430,000	100 00	135 25
Cons. Subway Co., N. Y.	3,000,000	100 00	25 00
Detroit Elec. Lt. & P. Co	300,000	25 00	14 00
Detroit Elec. Lt. & P. Co. 6s.	300,000		*101
Detroit Electrical Works	1,000,000	10 00	4 50
Direct U. S. Cable Co., Ltd	6,400,000	100 00	50 00
Edison Elec. Ill. 5s, N. Y.	3,250,000		*120
Edison Elec. Ill., Lebanon, Pa	80,000	10 00	13 75
Edison Elec. Illuminating, N. Y.	6,500,000	100 00	126 00
Edison Electric Light Co., Phil	2,000,000	100 00	105 00
Electric Protection Co., N. Y.	100,000	100 00	75 00
Elec. Sup. & Con. Co., N. Y.	120,000	15 00	16 00
Electrical Forging Co	2,000.000	100 00	85 00
Elmira Municip. Imp. Co., 5s	1,800,000		par
Erie Telephone	4,800,000	100 00	50 00
Fort Wayne Elec. Co	4,000,000	25 00	13 00
Franklin Electric Co., N. Y.	5,000,000	100 00	†83 00
Fremont E. L. & P. & Gas Co., O.	95,000	100 00	102 50
General Electric Co.	50,000,000	100 00	111 25
General Electric Co., 5s	7,931,000	10 00	*101

General Electric pret	4,223,700	100 00	116 00
Great West. Elec. Sup. Co. pref. 8s	350,000	10 00	10 00
Guarantee Identification Co., N. Y.	50,000	50 00	40 00
Hickory Electric Co., N. C.	12,000	100 00	112 00
Interior Conduit & Ins. Co., N. Y.	1,250,000	100 00	75 00
Int. Okonite, Limited	1,700,000	50 00	49 00
Laclede Gas Co	7,500,000	100 00	24 50
Laclede Gas pref.	2,500,000	100 00	74 00
Laclede Gas 5s.	10,000,000		*87
Law Telephone	400,000	100 00	96 00
Livingston E. Lt. Co., Mont., 6s.	30,000		*92
Marshalltown Elec. Co. 6s. Iowa	65,000		*98
Marysville L. & W. Co. 6s, Ohio	60.000		*98
Metropolitan Elec. Signal Co., N. Y.	1,500,000	100 00	35 00
Metropolitan T. & T., 5s.	2,000,000		*103
Metropolitan Traction			149 00
Morristown L. H. &P. 5s, N. J	30,000		*102
Morristown L. H. & P.	50,000	100 00	101 00
Nat'l Elec. Manuf. and Const. Co., N. Y.	50,000	100 00	101 00
N. E. Tel. & Tel. Co	10,394,600	100 00	59 00
N. Y. and N. J. Tel. and Tel. 5s	1,500,000		*98
N. Y. and N. J. Telephone Stock	2,535,000	100 00	98 25
N. Y. Storage Battery	100,000	100 00	96 00
North American Railway Co.	39,767,200	100 00	11 00
Postal Telegraph	10,000,000	100 00	81 00
Peninsular Elec. Lt. & P. Co., Va.	30,000	10 00	9 50
Pettingell Andrews Co., Boston.	200,000	25 00	30 00
Pittsburg Reduct. Co., Aluminum	1,000,000	100 00	105 00
Queen & Co., Phila.	600,000	100 00	100 00
Rockaway Elec. Light.	50,000	100 00	40 00
Sawyer-Man Elec. Light Co., N. Y.	125,000	100 00	100 00
Shaver Corporation, N. Y.	2,000,000	100 00	75 00
Short Elec. Ry. Co., Cleveland, O.	5,000,000	10 00	8 00
Standard Ug'd Cable Co., N. Y.	1,000,000	100 00	80 00
Suffolk Electric Co., Boston	300,000	10 00	10 50
Swan Incandescent	800,000	100 00	6 00
The Gamewell Fire Alarm Tel. Co.	750,000	100 00	100 00
The Hall Signal Co., N. Y.	1,900,000	100 00	100 00
The Hall Signal Co. pref., N. Y.	100,000	100 00	115 00
The Ongley Electric Co., N. Y.	250.000	100 00	85 00
The Siemens & Halske Co., Ill.	500,000	100 00	par
The Washington Wat. Pow., Wash.	1,500,000	100 00	90
The Wells & French Co., Ill.	600,000	100 00	par
T.-H. Electric Co. 5s, N. Y.	500,000	30 00	*101
U. S. Rubber Co.	13,481,000	100 00	45 50
U. S. Rubber Co. pref. 8s.	12,942,500	100 00	96 00
Western Union	100,000,000	100 00	96 50
Westinghouse Elec. & Manf. Co	7,000,000	50 00	35 00
Westinghouse Elec. Co. pref. 7s.	4,000,000	50 00	50 00
West Point W. Lt. & P. Co., Va.	25,000	100 00	101 00

*Per cent. †Registered stock.

FINANCIAL.

There seems to be a fair chance once more for successful investment in storage batteries. Rumors of their introduction on cars and kindred applications come from a number of sources, and there is no doubt that portable power of this nature must have its place in the business of the country. It is rather bad policy to suggest at this late day, when electric storage is so well understood, that on the assertion of the introducer, whether he be the inventor or not, any large sum be risked ; all that is required is sufficient for a test and expenses. If an advance is shown, capital will come simply by whistling for it. The latest is to the effect that the storage battery is to be tried on the Brooklyn Bridge. There can scarcely be a better place for it as a test, but when they have their own power-house, with plenty of power and nothing required but a few dynamos and the wiring for a trolley system, and this all within their own territory, with no possible interference from any one, it certainly seems they might save the price of the batteries and all connected with them. Yet it is well to have the test made there, as plenty of customers will be found to employ it just as soon as shown to be of sufficient practical value. It is said the new battery will haul heavy freight cars forty miles an hour, but we don't want any such speed as that either on the bridge or any of our city street-car routes. That seems to be the stumbling-block of most inventors ; they begin at the wrong end, turn up their noses at a little launch or boat, and want to begin on the largest steamship afloat and run her across the ocean in three days, or, as in this case, run surface cars up and down Broadway at the speed of forty or fifty miles an hour. Better put more money in a slower battery scheme. The telephone is to-day practically public property, but I have not been officially notified of any grand opposition to the Bell system and business. So many people have expected so much from the expiration of the basis patents that not reciving anything whatever seems to have dazed them, and they now await with open-mouthed astonishment a development which does not come. I admit that I thought there was private snap enough to produce and immediately introduce an opposition worthy of the great corporation, but taking it up in current course, a little in advance, I soon found that the Bell is in practical and peaceful possession of a thousand-mile circle, and a very few of these cover the whole domain, used on the same principle as the distributing stations of the post-office department ; less than half a dozen circles will supply the whole United States. New York, of course, loses her thousand miles east, but has it north, south and west, while Chicago's circle about includes the business points of America. There must be a great many details to settle up before the new order of things is on a business footing. Many of these will drop in naturally, but where there is money and men some are sure to show the cloven foot. There will, no doubt, be a reorganization of some kind this year, and the capital doubled, or more. It now stands, and has been for a year, at over 200, as will be seen by referring to the list. We must be a little patient until the executive committee is ready to talk. Many of the acoustic companies are doing a nice business, and there is good money to be made there by investors with little or no risk. I note some more money going to waste in Boston over the Edison incandescent lamp. People fail to understand that it makes no difference who conceived the lamp ; the United States courts say Edison did, and give him the benefit. There is no money in fighting after that. It makes Uncle Sam your opponent, not Mr. Edison. Take a few lucid moments and think it over. The Stock Exchange is a paradise for investors this spring, and the speculators are turning in more money than for years; not only that but it all has a firm, healthy, permanent look about it. Electrics hold their own up among the front seats; every dollar put into them should double this year.

FINANCIAL NOTES.

In the annual report of Mr. Spencer Trask, president of the Edison Illuminating Company of New York, for 1892, some interesting and instructive facts and figures are given. The growth of business has been steady.

The following statement shows remarkable increase in service during the year ending December 31, 1892 :

	1891.	1892.	*Increase.*
Number of customers	2,875	4,344	1,469
Number of 16 C. P. lamps	94,485	142,492	48,007
Number of motors, H. P.	2,000	3,807	1,807
Number of arc lights	841	1,637	796

"Estimating each horse-power motor and each arc light as equal to ten 16 C. P. lamps, the present installation is equal to 196,932 lamps," the report says. The gross earnings of stations for the year were $963,021, an increase of $287,516, and the net earnings were $475,138, an increase over 1891 of $127,910.

THE receiver of the McKeesport Light Company, McKeesport, Pa., has reported the receipts to have been $99,015.28, the disbursements, $40,464.10, and the balance on hand, $58,549.18.

THE Bristol Electric Light Company, Bristol, R. I., has declared a three per cent. dividend.

THE Brockport Electric Company, Brockport, N. Y., declared a 4 per cent. dividend.

The Bridgeport Electric Light Company, Bridgeport, Conn., has increased its capital from $200,000 to $300,000.

The Excelsior Electric Light Company, Port Huron, Mich., has increased its capital to $150,000.

The Edison Illuminating Company, Detroit, Mich., increased its capital from $300,000 to $350,000.

The East End Electric Light Company, Pittsburg, Pa., has declared a quarterly dividend of 1¼ per cent.

TRADE NOTES.

Frank R. Chinnock, 18 Cortlandt street, New York city, Eastern agent of the Ball Engine Co., of Erie, Pa., reports large sales of this well-known engine throughout his territory. The following are among the recent orders he has filled: Buffalo, North Main and Tonawanda St. Ry. Co., Tonawanda, N. Y.; Ithaca St. Ry. Co., Ithaca, N. Y.; Seabury & Johnson, East Orange, N. J.; Hahne & Co., Newark, N. J.; Dow's Stores, Brooklyn, N. Y. The Ball Engine Co. recently issued a handsome descriptive catalogue, and Mr. Chinnock would be glad to furnish them to any one desiring information on automatic high-speed engines for electrical purposes.

The Electrical Repair Works, Buffalo, N. Y., have located in the Jewett building, and are now prepared to undertake all kinds of electrical repair work. R. B. Busey and A. A. Temple, both well known in the electrical fraternity, are interested in the concern. Mr. Temple reports a big business.

Mr. J. H. Lawrence has resigned his position as superintendent of the People's Electric Light and Power Co., Silver Creek, N. Y., and has established himself as consulting engineer at Buffalo.

The Clyde Electric Motor Co., of 147 Charles street, Providence, R. I., is having a large trade in its motors. The No. 1 motor, designed for fan use, is very convenient, and can be placed in any position. The No. 2 motor runs from battery or alternating current and is designed for sewing-machines, dentists' drills, fans, etc. Both these motors take up little space and are very efficient. The company also makes cigar-lighters and all sorts of small electrical apparatus.

The mining department of the General Electric Company has received two letters from the superintendents of two coal-mines in Pennsylvania showing the advantages of electric haulage plants in their mines over ordinary methods. Their reports are decidedly in favor of electricity, and all interested in such matters would do well to know what these two mine superintendents have to say on the subject.

The Electrical Age's Illustrated Record of Patents.

Issued January 24, 1893.

490,279. Electric Meter. Oscar Frölich, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Nov. 16, 1892. Patented in Germany April 16, 1889, No. 50,082· in England July 11, 1889, No. 11,179; in Austria-Hungary July 11, 1889, No. 30,454 and No. 59,934; in Switzerland July 13, 1889, No. 1,366; in France July 15, 1889, No. 199,583; in Belgium July 15, 1889, No. 86,985, and in Italy July 24, 1889, No. 25,875.

490,280. Electric Motor. Julius W. Hansen, St. Paul, Minn., assignor of one-half to William H. Eimers, same place. Filed Sept. 25, 1891.

490,292. Cut-Out for Electric Circuits. Michael Leavy, Pittsfield, Mass. Filed June 16, 1892.

490,302. Insulator. Louis McCarthy, Boston, Mass. Filed July 8, 1892.

490,306. Closed Conduit for Electric Railways. Russell Parker and Benjamin F. Sutton, Brooklyn, N. Y. Filed Jan. 9, 1892.

490,327. Electric-Annunciator System. Henry Van Hoevenbergh, New York, N. Y. Filed March 24, 1892.

490,353. Electric Mat. William G. James, Harlem, Ill. Filed Sept. 29, 1892.

490,373. Apparatus for Stopping Engines. Frederick D. Taylor, Hartford, Conn., assignor to the Electro-Automatic Appliance Company, same place. Filed April 26, 1892.

490,376. Armature for Dynamo-Electric Machines or Motors. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed July 10, 1891.

THE "CLARK" WIRE.

Insulation Guaranteed wherever used, Aerial, Underground or Submarine.

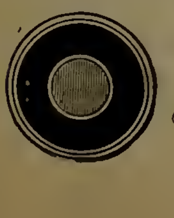
In a letter from the Inspector of the Boston Fire Underwriters' Union, under date of March 29, 1886, he says:

"A thoroughly reliable and desirable Wire in every respect."

The rubber used in insulating our wires and cables is especially chemically prepared, and is guaranteed to be waterproof, and will not deteriorate, oxidize or crack, and will remain flexible in extreme cold weather, and is not affected by heat The insulation is protected from mechanical injury by one or more braids, and the whole slicked with Clark's Patent Compound, and special extra finish. which we have now adopted for all our solid wires as an extra weather-proof protection, and also preventing chafing and abrasion, which is water, acid, and to a very great extent fireproof. Our insulation will prove durable when all others fail. We are prepared to furnish Single Wires of all guages and diameter of insulation for Telegraph and Electric Lights from stock. Cables made to order. We are now prepared to furnish our Clark Wire with a white outside finish for ceiling cleat work as well as onr standard color.

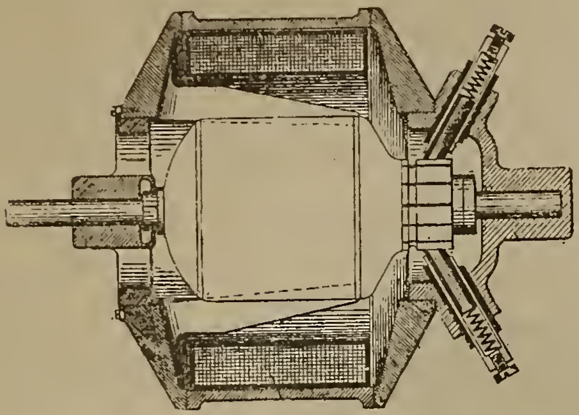
Clark Joint Gum should be used for making waterproof joints. This is put up in half-pound boxes, in strips about one foot long and five-eighths inch wide, and when wrapped about a joint and pressed firmly it makes a solid mass. **FOR RAILWAY** and **MOTOR** use we make all sizes of stranded and flexible cables with Clark insulation.

WE GUARANTEE OUR INSULATION WHEREVER USED. AERIAL, UNDERGROUND OR SUBMARINE, and our net prices are as low, if not lower than any other first-class Insulated Wire. We shall be pleased to mail Catalogues with terms and discounts for quantities.



EASTERN ELECTRIC CABLE CO.,
61 to 65 Hampshire Street, Boston, Mass.
HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician

490,449. Dynamo-Electric Machine. Robert Lundell, Brooklyn, assignor of two-thirds to Edward H. Johnson, New York, N. Y. Filed June 21, 1892.



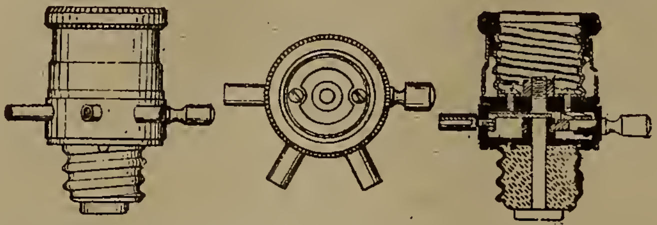
490,449.—DYNAMO-ELECTRIC MACHINE.

490,460. Dynamo-Electric Machine. Charles Wachtel, Newark, N. J. Filed June 13, 1892.

490,477. Electrical Connecting Device. Joseph Hutchinson, New York, N. Y. Filed Sept. 16, 1892.

490,534. Support for Telegraph Cables. Frederick Le B. Bedwell, London, England. Filed Sept. 26, 1892. Patented in England July 21, 1892, No. 13,380.

490,560. Insulator. Auguste J. Hauty, Saltsburg, Pa., assignor of one-third to John Burke, same place. Filed Aug. 29, 1892.



490,605.—ELECTRIC-LAMP SOCKET AND TAP.

490,597. Conductor System for Electric Railways. Raphel Hayden, Fairmont, W. Va. Filed April 13, 1892.

490,605. Electric-Lamp Socket and Tap. Alexander E. Vetter, New York, N. Y., assignor to J. C. Vetter & Co., same place. Filed May 20, 1892.

490,630. Electric Conduit. Ernest L. Ransome, Oakland, Cal. Filed April 5, 1892.

VULCANIZED FIBRE COMPANY,
Established 1873.
Sole Manufacturers of HARD VULCANIZED FIBRE,
In Sheets, Tubes, Rods, Sticks and Special Shapes to order. Colors, Red, Black and Gray. Send for Catalogue and Prices.
FACTORY: WILMINGTON, DEL. **The Standard Electrical Insulating Material of the World.** OFFICE: 14 DEY ST., N. Y.

THE CLARK COMPANY, NEW YORK, 192 BROADWAY,
CLARK is the only Company in the United States that makes a specialty of manufacturing under own patents, Electric Arc Lighting Apparatus for every purpose, including the finest arc lamp in every respect, suitable for any class of interior lighting, with plain or ornamental fixtures, and can be used on incandescent circuits, on any voltage from 65 upwards, in series or single, or on arc circuits of standard current.

SAL AMMONIAC
(ELECTRIC BRAND)
For Electrical Purposes
Guaranteed 98/99% and free of lead and iron. If you want the best quality ask your dealer for this brand. Imported by
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ELECTRIC (TRADE MARK) BRAND.

Over 99 Per Cent. Pure
SAL-AMMONIAC.
INNIS & CO.,
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Scrap and Native Platinum Purchased.
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RODS AND PLATES FOR BATTERIES.
H. LAMARCHE'S SONS,
83 John St., N. Y.

ELECTRICAL AGE

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SOME GOOD SUGGESTIONS.

Free wiring was the subject of a paper read by Mr. J. M. Campbell, at the convention of the Canadian Electrical Association, held in Toronto last month. The paper, which is a short one, is published in full elsewhere in this issue. It contains some suggestions that might be profitable for American electric-light managers to carry out.

OBITUARY.

M. Van Rysselberghe, a well-known electrician, and familiar to most American electricians through his connection with the development of the telephone in Europe, died in Antwerp, Belgium, on February 3. M. Van Rysselberghe invented a method of simultaneous telegraphy and telephony on one wire, and was largely instrumental in the introduction of the telephone in Belgium and other European countries.

THE ST. LOUIS CONVENTION.

As the time draws nigh for the annual convention of the National Electric-Light Association, which will be held in St. Louis on the last day of this month and the first and second days of next, preparations for the event are becoming more active. The genial master of transportation, Mr. C. O. Baker, Jr., is, as usual, exerting himself to provide the very best transportation facilities to the convention city from this section, and the St. Louis brethren are also exerting themselves to provide proper entertainment for the visitors when they get there. The popular president of the association, Mr. Ayer, is at the head of all movements in St. Louis, looking to making every one of the delegates comfortable and pleased with their visit. We will likely have the programme in our next issue, and our readers will then know more definitely what to do and how to go at it. Secretary Porter informs us that there is a strong probability that Prof. George Forbes, of London, will attend the meeting and read a paper there. Besides this paper and the lecture of Mr. Tesla, papers on the following-named subjects are announced: "Some Experiments with the Alternating System" (Mr. Sterling); "Long-Distance Transmission of Power" (Mr. Bradley); "Under What Conditions is the Use of Water-Power Economical?" (Mr. L. B. Stillwell); "Preservation of Poles and Cross-Arms" (Mr. Myers); "The Incandescent Lamp" (Mr. Townley), and others by Messrs. Stanley, Bell, Brophy, Browne and Adams.

THE TELEPHONE.

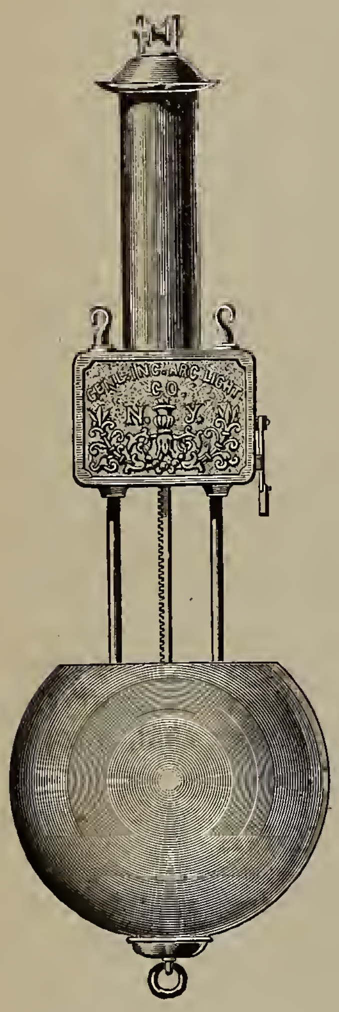
The telephone situation is becoming an interesting one. Coincident with the expiration of the various patents on the telephone, the enjoyment of which has been for so long exclusively in the hands of one company, there comes abundant evidence that many other concerns intend to engage in the telephone business as soon as they can safely do so. With the expiration of the patents on the Blake transmitter last month came an extraordinary call for these instruments from all quarters, and when the patents on the Bell receiving instrument terminate, not only will a great demand for receivers spring up, but the event will in all probability signallize the birth of competing telephone companies all over the land. There is every promise of lively times ahead for the telephone business. In the enthusiasm that will ensue there is danger of going to extremes. The business will thus become demoralized as far as rates and profits are concerned, then an era of consolidation will dawn, and the result will be the formation of trusts and combinations. This is one way of looking at the matter, and as the tendency these times is to consolidate like interests and carry on the business under one management, there appears to be no reason why the telephone should be exempt from the operation of the rule. These are matters, however, that time alone will settle, and those who wish to engage in the telephone business in any capacity whatever need not be deterred from making an effort to succeed simply because of what may happen.

NEW INCANDESCENT ARC LAMP.

The need for an electric lamp that would give a cheaper light than the incandescent lamp naturally called the attention of inventors to the desirability of adapting the arc lamp to work in conjunction with the incandescent lamp. The result has been the production of arc lamps for use on incandescent circuits, but with one or two exceptions these have failed to fill the requirements with any measure of success.

Our attention has been called to an arc lamp of this class that seems to be perfection in every desired respect. The main requirements, of course, in such a lamp are steady light, simplicity of construction, reliability and ease in trimming, and this new lamp seems to meet these qualities to an extent that leaves nothing to be desired.

At the corner of 33d street and First avenue, New York city, is a large, substantial brick factory building, formerly occupied for the manufacture of gas-fixtures and electroliers. This building is now owned and occupied by the General Incandescent Arc Light Company, of which Mr. Sigmund Bergmann is president. Many styles of its lamps are now being produced, from the plain outside lamp to the elaborately ornamented and artistic affair designed for interior use. With all of its machinery, and tools of the latest improved design, every detail of the lamp is made from beginning to end in this factory under the company's own supervision.



STANDARD LAMP.

ORNAMENTAL LAMP.

The lamp mechanism is exceedingly simple, consisting practically of only three wheels, a single magnet and a spring, and it has no dash-pot. This simplicity means less liability to trouble and getting out of order. The German-silver resistance wires, which are mounted on the outside of the lamps, are insulated with porcelain, which renders the resistance both fire and water proof.

The standard 8 and 10 ampère lamps are arranged to run two in series on a constant circuit of 100 to 125 volts, but (up to 6 ampères at present) they can also be run three in series, and the readiness with which three lamps so placed get into perfect action is indeed remarkable. The operation of these lamps connected in series was witnessed by a representative of the ELECTRICAL AGE. They at once adjusted themselves and gave a wonderfully steady light. The light from these, as well as from the regular two in series 8-ampère lamps was equal in steadiness to that of the incandescent lamp.

We noted also the ability of the lamp to maintain light under a wide range of pressure. The voltage was varied between 100 and 125 volts without affecting the steadiness of the light in the least degree, the only effect being, naturally, the increase and decrease of candle-power, or brilliancy, as the voltage was increased or decreased. This feature of the lamp is a valuable one, and important in practice, not only as all currents are subject at one time or another to fluctuations, but because it enables the consumer to vary the amount of light at will by simply changing his pressure and without changing the lamps.

LARGE THEATRE OR HALL LAMP.

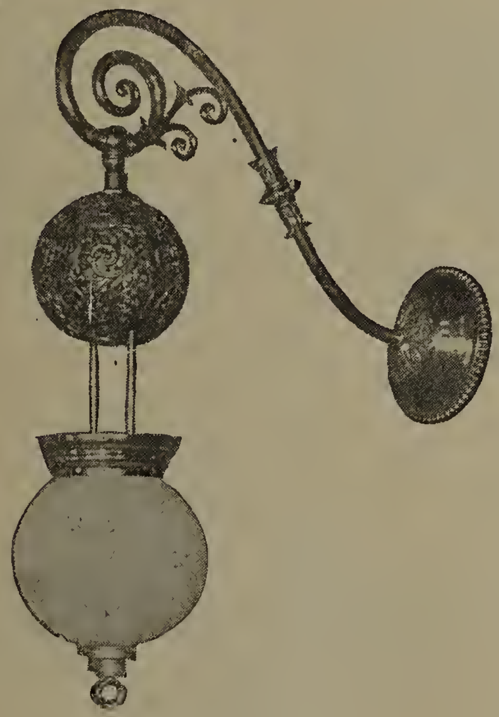
The company makes lamps taking current of from 3 to 25 ampères, the mechanism in all, however, being exactly the same, the only difference being in the external resistance.

Another great advantage, which is in the direction of economy in maintenance, possessed by these lamps lies in the construction of the lower carbon-holder which permits the changing of the carbons without taking down the globes. Any servant or other employé can trim the lamps with the greatest facility. The lower carbon holder, as it screws into place at the same time firmly clamps the carbon.

In the temporary show-room at the factory, there are a variety of lamps on exhibition—from the plain outside lamp to the most elaborate theatre or church lamp. Hanging from the centre of the ceiling is an elegant large lamp of the latter class, which is beautiful in its design and ornamentation. It has a large round globe, about which is a net-work of bronze filigree work, and its fittings are of the same metal artistically wrought. Numerous other handsome designs were hung about the room and were all in operation at once, without a sound or flicker being evident.

The "Bijou" lamp is one of the latest designs, and is the pride of the company. It is a beautiful expression of art, and no doubt will meet with a large sale. It is a small lamp, intended for artistic interior lighting, with round globe, and is certainly very attractive. It has ribbon feed instead of rack-rod, and can be placed singly or two or three in series on a 110-volt circuit, or six in series on a 220-volt circuit. It gives from 150 candle-power up, can be made to range from 3 to 8 ampères and to burn 8 to 10 hours.

Low ceiling larger lamps are also shown. These are the same in mechanism and other respects as the rack-rod lamps, except that a ribbon winding on a drum is substituted for the rack-rod, accomplishing a saving in length of over a foot, which is very important when ceilings are low.



"BIJOU" LAMP.

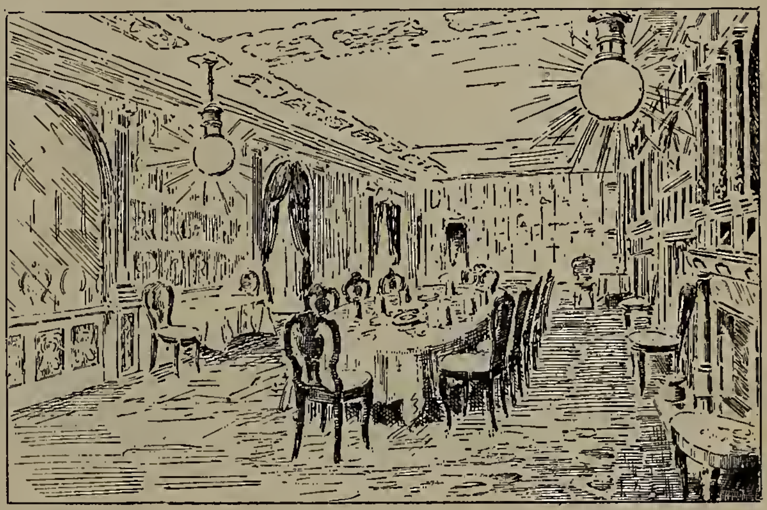
The standard lamps weigh eighteen pounds complete (without globe), burn 12 hours and, with an 8 ampère current, give about 1,000 C. P. light; with 10 ampères, about 1,300 C. P. The quiet, brilliant light of this new lamp is certainly remarkable. It is as steady as that of the incandescent lamp, and there is an entire absence of the flickering and sputtering we are accustomed to associate with arc lamps. There seems to be no reason whatever why it should not find a large use in places now absolutely controlled by the incandescent lamp, as the quality of the light seems to be far more pleasing, is better diffused, and more satisfactory in every way, and, considering the candle-power furnished for a given expenditure of current, no other light, it is said, approaches it in cheapness.

The General Incandescent Arc Light Company's offices are at No. 59 Duane street, corner of Elm. Its show-rooms are at No. 275 Fifth avenue, near 29th street; also at its works, corner of 33d street and First avenue.

THE Fort Wayne Electric Co. has secured a franchise for the erection of an electric-lighting plant at Arcade, N. Y.

DINNER.

On Wednesday evening, January 11, an elegant dinner was tendered at the Holland House, New York, to the officials of the Postal Telegraph and Cable Company, and the architects of the new building now in course of erection at Broadway and Murray street. Invitations for the affair were extended to the guests by Mr. Edward W. Seymour, of the Westinghouse Electric and Manufacturing Company; Mr. Walter C. Kerr, of Westinghouse, Church, Kerr & Company, Mr. F. J. Sprague, of the Sprague Electric Elevator Company, and Mr. Paul Lemaire, the contractor for fixtures and construction work—the combination representing the electric light and power service to be furnished for the new building. The guests were Mr. John W. Mackay, president, G. G. Ward, vice-president and general manager, and E. C. Platt, secretary of the Commercial Cable Company; Mr. A. B. Chandler, president, Mr. W. H. Baker, vice-president and general manager of the Postal Telegraph Company; Mr. George E. Harding and W. T. Gooch, the architects of the building; Mr. Charles Cuttriss and F. W. Jones, electricians of the Commercial Cable and Postal Telegraph Companies, respectively. Invited to meet the above were Messrs. M. E. Graves, H. L. Shippy, Richard Dey, of San Francisco; C. A. Benton, W. E. Eldred, George W. Hebard, vice-president, P. Fred Kobbe, treasurer, and H. McN. Harding, of the Westinghouse Electric and Manufacturing Company.



GILT ROOM, HOLLAND HOUSE, SHOWING LEMAIRE LAMPS.

The idea of the dinner originated with Mr. Seymour and it was a rich affair. The dinner was given in the Gilt Room of the hotel. One of the features of the electrical decoration and equipment for the occasion was the use, for the first time, of the new Lemaire low-tension arc lamp. The performance of this lamp elicited much praise.

The dinner was entirely informal, and the only toast proposed was by Mr. Seymour, to the success of the Postal Telegraph Company. Mr. Chandler responded to the toast in a very appropriate manner. The rest of the evening was spent in social and mental enjoyment, story-telling, etc. It was an elegant affair, and was all the more enjoyable by the total absence of formality.

Mr. Bowman, of the Holland House, showed excellent taste in the management of the dinner, and the results of his efforts reflect great credit on his ability in the particular line of entertaining, for which the hotel is noted.

ON January 27 the Capital City Gaslight Co., of Des Moines, Ia., bought the electric-light plant of the Des Moines Water Power Co. The consideration was $100,000.

IMPROVED TROLLEY-LINE FITTINGS.

We are pleased to call attention to several novelties in trolley-wire fittings manufactured by the New York Electrical Works, 161 Washington street, New York city.

The new mechanical clip (Fig. 1) is radically different from any in the market. The trolley-wire is suspended in a U-shaped piece of sheet copper, No. 16 gauge, which is in turn hung on lugs, three of which are cast on each side of the body of the clip, and a saw-cut made in the top of each, into which the copper is drawn tightly by forcing a wedge between the clip-body and the trolley-wire. The small end of the wedge has a saw-cut where it projects beyond the clip-body and by opening this cut slightly with a cold-chisel, the wedge is effectually locked in place. The top of the clip-body is furnished with a ⅝″ threaded bolt which screws into a bushing in the insulation of the hangers, or if desired they can be furnished with a threaded socket to receive the bolt of the T.-H. hangers. It seems to be a simple, strong and effectual clip, and secures the trolley-wire absolutely from falling out of it. It also has the advantage of being removable, and can be used over and over again if desired.

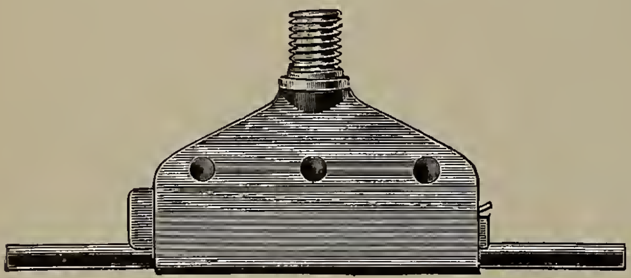


FIG. 1.

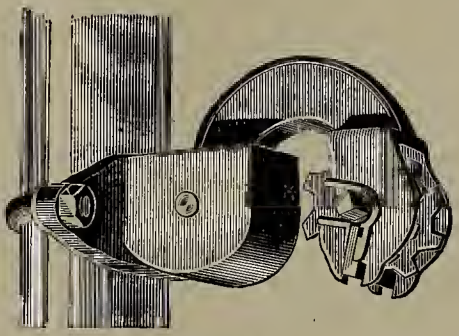


FIG. 2.

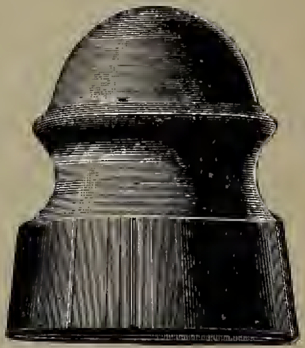


FIG. 10.

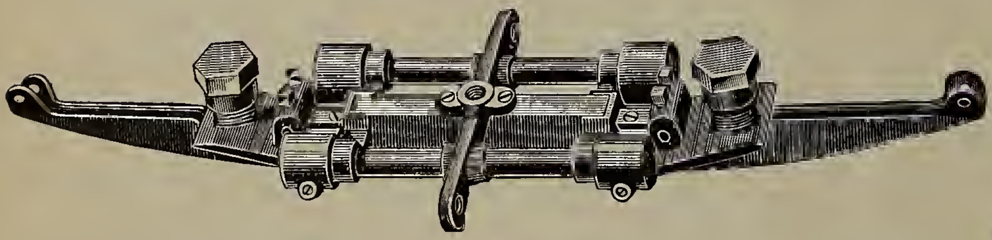


FIG. 4.

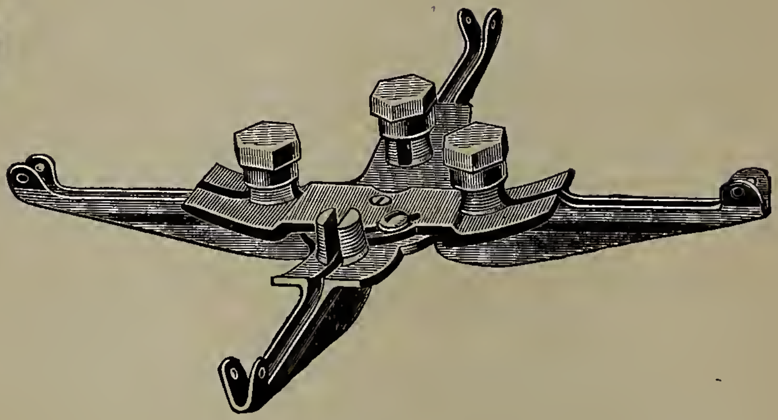


FIG. 5.

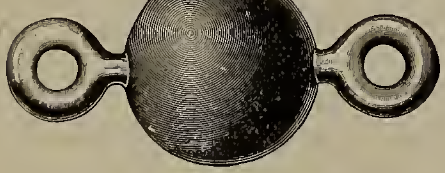


FIG. 3.

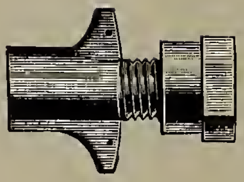


FIG. 13.

It will be noticed that all of the fittings shown are used without solder. The solder-pot can be entirely dispensed with if these are used.

A slight modification of this clip, by making a ring at each end, makes a simple and effectual strain ear, and another slight modification makes an excellent feeder ear of it.

The splicing-ear is an exceedingly simple and strong mechanical device, which will be easily understood from an inspection of the illustration. No solder is used in this either.

A decided novelty is the insulated pole-ratchet (Fig. 2), the insulation of fiber tubes and washers being completely sheltered from the weather by the hood while, at the same time, the ratchet is exposed and easily accessible by the lineman. This is a very cheap and efficient device.

The insulation furnished by this company is made for them by the Fiberite Company and is now for the first time put on the market. It is called the "Medbery" insulation, after the inventor, and it is an extremely tough and strong compound, made of the most expensive materials used for this purpose, and moulded into shape by powerful hydraulic presses under a pressure of between one and two hundred tons. It presents a very handsome appearance, and is guaranteed to be the best insulating material on the market. It is moulded into all shapes used on trolley lines, such as globe insulators (Fig. 3), straight-line hangers, single and double pull-offs, and especially into a universal bell, which can be fitted into skeleton hangers made especially for this purpose. We predict for it a large sale as soon as it becomes known.

The circuit breaker (Fig. 4) is very strong, and so constructed that should the entire insulation be destroyed the sustaining of the trolley-wire will not be affected. It is said they will resist a greater tension than will the trolley-wire itself. The circuit breaker was in use last year and has proved a very efficient fitting.

The right-angle crossing (Fig. 5) can be used for any angle from 60 ° to 90 ° and is easily and quickly placed in position, and as easily removed.

The acute-angle crossing (Fig. 6) is identical with the right-angle crossing, except in that it is designed for crossing under an angle of 60°.

The right-hand switch is shown in Fig 7. These appliances possess all the qualities of strength, durability and ease of erection and removal from the line, and are cast from a specially tough bronze. They are guaranteed to be uniform in quality of material, and are finished in a careful and workmanlike manner. The same is true of the left-hand, Y and 3-way switches.

Fig. 8 shows a splicing ear. The ends of the wire are held by the collar, thus enabling the splice to be made quickly and easily. The ear is suspended from the hanger by a ⅝ iron stud-bolt.

The bond-wire (Fig. 9) is made in one piece, either in galvanized iron or copper ; the rivets forming a part of the whole.

Fig. 10 shows a feed-wire insulator made of fiberites,and Fig. 11 is a knife-switch, made in all capacities to order.

The strain ear (Fig. 12) is the old form, no solder being used, and Fig. 13 shows a simple and effective guard-wire clamp.

We know from personal inspection that all fittings made by this company are of the best materials and made in a careful and workman-like manner.

FREE WIRING.*

BY J. M. CAMPBELL.

When arc lighting was first introduced in this country it was customary to put lamps and wires into the premises of the consumer free of charge. This was no doubt the origin of free wiring. As the business increased and incandescent systems of lighting were introduced, this practice was in a great many instances still continued. The simple wires of the arc system multiplied in number and size. The labor of installing these wires increased greatly. A better insulation was called for; incombustible fittings and better workmanship were the order of the day, until, at the present time, if interior wiring for any incandescent system is put in properly it requires good material and good workmen. Both of these cost money. In the face of all this a great many of the local lighting companies sail serenely on, wire up places of business and houses free of expense to the owners, charge the outlay to "capital account" and post it up in their books as an asset. The stockholders at the end of the year very likely obtain a stock dividend, and may consider themselves very fortunate if they are not called on to subscribe for a further issue of stock for extensions and improvements—unfortunately improvements to the property of other parties, and which, if an asset at all to the lighting company doing the work, is of a very doubtful character—the kind of an asset which should be written off the books every year as a dead loss. Where do we hear of gas companies piping up customers' premises free of charge? This is seldom if ever done, and yet in small towns the gas-making industry does not seem to be any great bonanza, and it is generally conceded that gas-light can be manufactured cheaper than incandescent electric light.

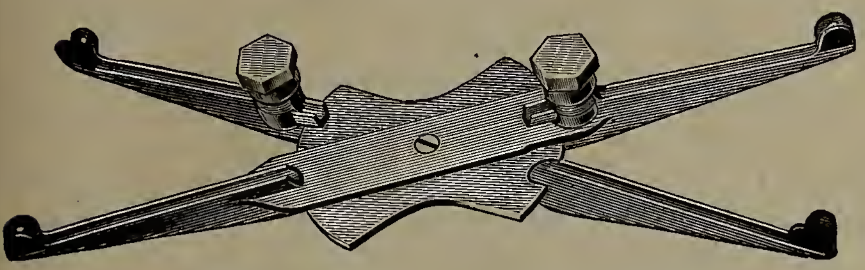


FIG. 6.—TROLLEY-LINE FITTINGS.

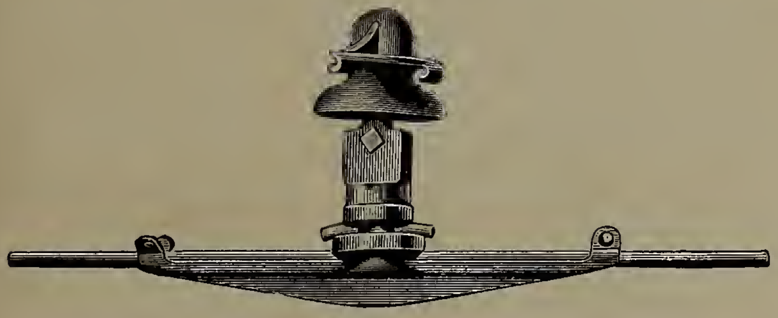


FIG. 8.

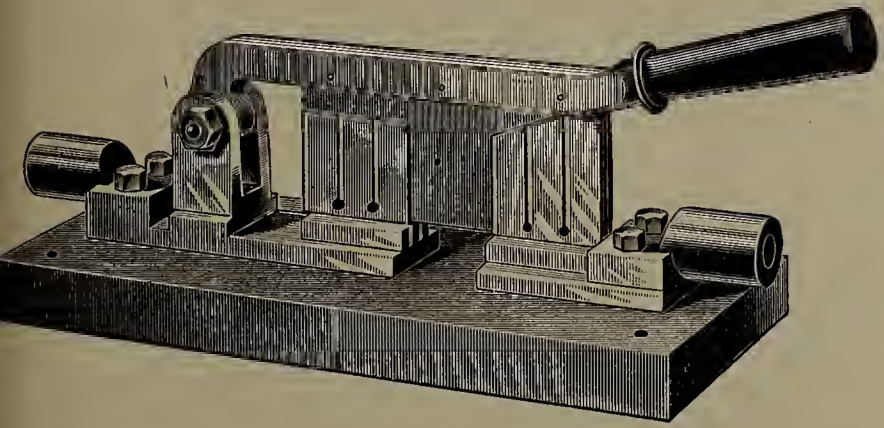


FIG. 11.

No doubt when an electric lighting plant is installed in a town a greater number of customers can be obtained by supplying all interior work free of charge, but when this is done the company is at the mercy of the consumer. On the slightest pretext the company is ordered to take out the lights and wires by the customer, who has not any financial interest in the stuff, and the company's asset of so many lights wired up becomes a scrap-heap of very little value. If the customers put in their own interior work it saves a large outlay to the company in the first place. They then have an interest in it and will not be inclined to cut off the current without good reasons. When pay-day comes around the collector will find that he has a different man to deal with than our friend with the free wires. By abolishing free wiring a better class of customers will be secured. The lighting company's expense will be cut down considerably, as all changes and repairs can be charged for. There will not be so much capital invested and therefore less dividends to pay, and on that account a cheaper service can be given. Give the people a perfect service at as low a figure as possible, and make them pay for everything inside of and including the main-line cut-out.

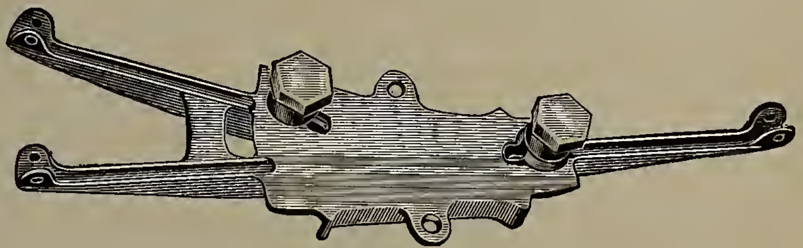


FIG 7.

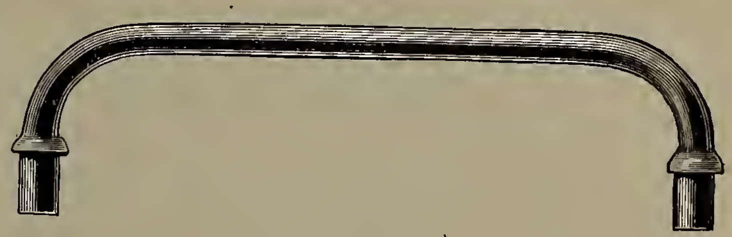


FIG. 9.

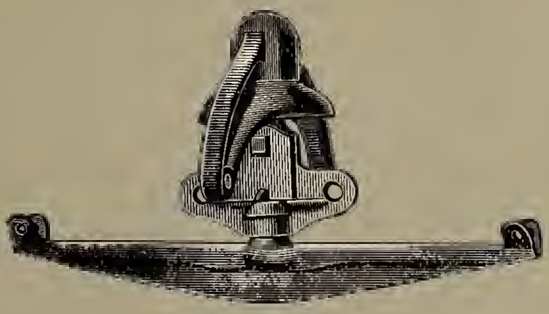


FIG. 12.

The company may not secure quite as much business, but it will show a much greater net gain at the end of the year. The business will increase much quicker than the capital account, and by and by, when a street circuit must be extended or a new dynamo put in, the money will be on hand to do it with which would otherwise have been squandered on free wiring.

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* Paper read at the convention of the Canadian Electrical Association, held in Toronto, Ont., January 25 and 26, 1893.

ELECTRICAL DISPLAY ADVERTISING.

Patents have been applied for by Mr. H. T. Richards, of New York city, to cover a unique way of advertising in electrical railway cars.

It is designed to take the place of the present method of using card-board signs. In the space where these are hung there will be mounted neat frames, with glass ground on one side, and cut in the size usual for the street-car advertising panels. One or more incandescent lamps will be placed behind this panel, and in some cases suitable reflectors can be placed behind the lamps. The advertising copy may consist of tin or cardboard, or any other opaque substance. The letters, trademarks or designs will be cut out of the substance used, so that the rays of electric light may shine through. Colored letters can be made by the use of colored lamps.

A novel feature of this invention is that only one advertisement is illuminated at a time. Each is illuminated in turn, which turn may not be after the illumination of the one next to it, but after an illumination in another part of the car. There is no noise connected with this and the illumination takes place without any warning.

The electrical device which operates these signs is simple in construction, and the current used in driving the car can be used in lighting these signs. The circuit connections are so arranged that an automatic circuit-closer, controlled by a clock, will successively light the signs.

It is claimed that this mode of advertising is as practical during the day as it is in the evening. By the aid of storage batteries this method of advertising could be introduced into cars propelled by means other than electricity.

The accompanying illustrations almost explain themselves. In Fig. 1, A, represents the clock and "Pearline" an illuminated sign. Fig. 2 shows how the illumination is controlled by the clock, and Figs. 3 and 4 show how the clock controls the illumination.

Mr. Richards is well known in the electrical trade, being manager of the *Electrical Review*, of New York city.

Fig. I.

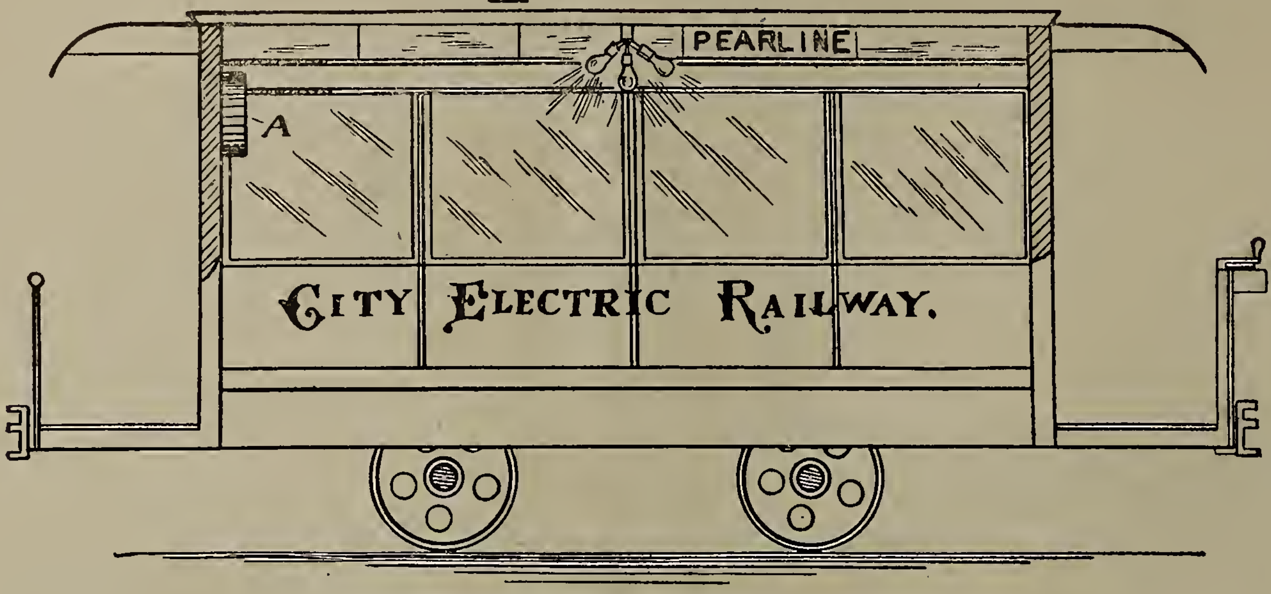


Fig. 2.

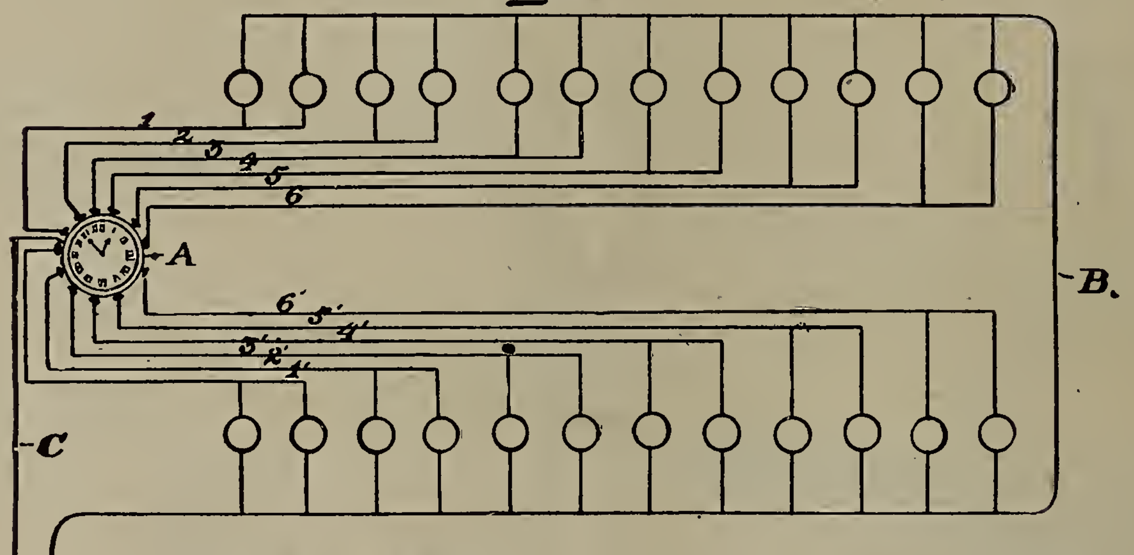


Fig. 3.

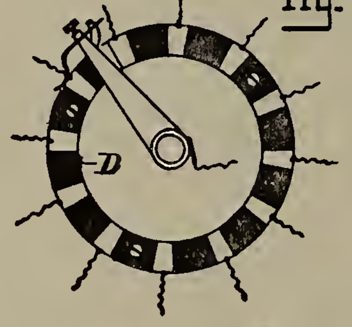
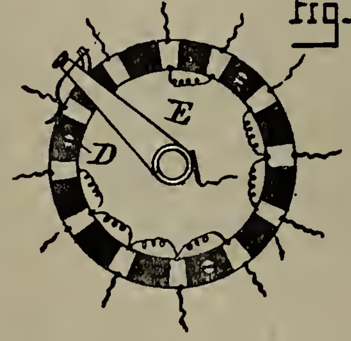


Fig. 4.



MARINE ELECTRIC-LIGHT PLANTS.

The many advantages possessed by the electric light over all other methods of illumination on ship-board are being generally recognized by boat owners, with the result of a large and increasing demand for electrical apparatus for such uses. Obviously the question of space is one of importance in connection with the installation of a marine electric-light plant, and the necessity for the combination of efficiency and minimum of space has led electrical apparatus manufacturers to so design such plants as to attain these objects to as great degree as possible.

Among the concerns which have given this particular class of electrical apparatus special attention with successful results may be mentioned the Riker Electric Motor Co., of 45 and 47 York street, Brooklyn, N. Y. This company has a large marine trade, and the demand for this class of machinery has become so great that the Riker Company has found it necessary to produce a special catalogue on the subject.

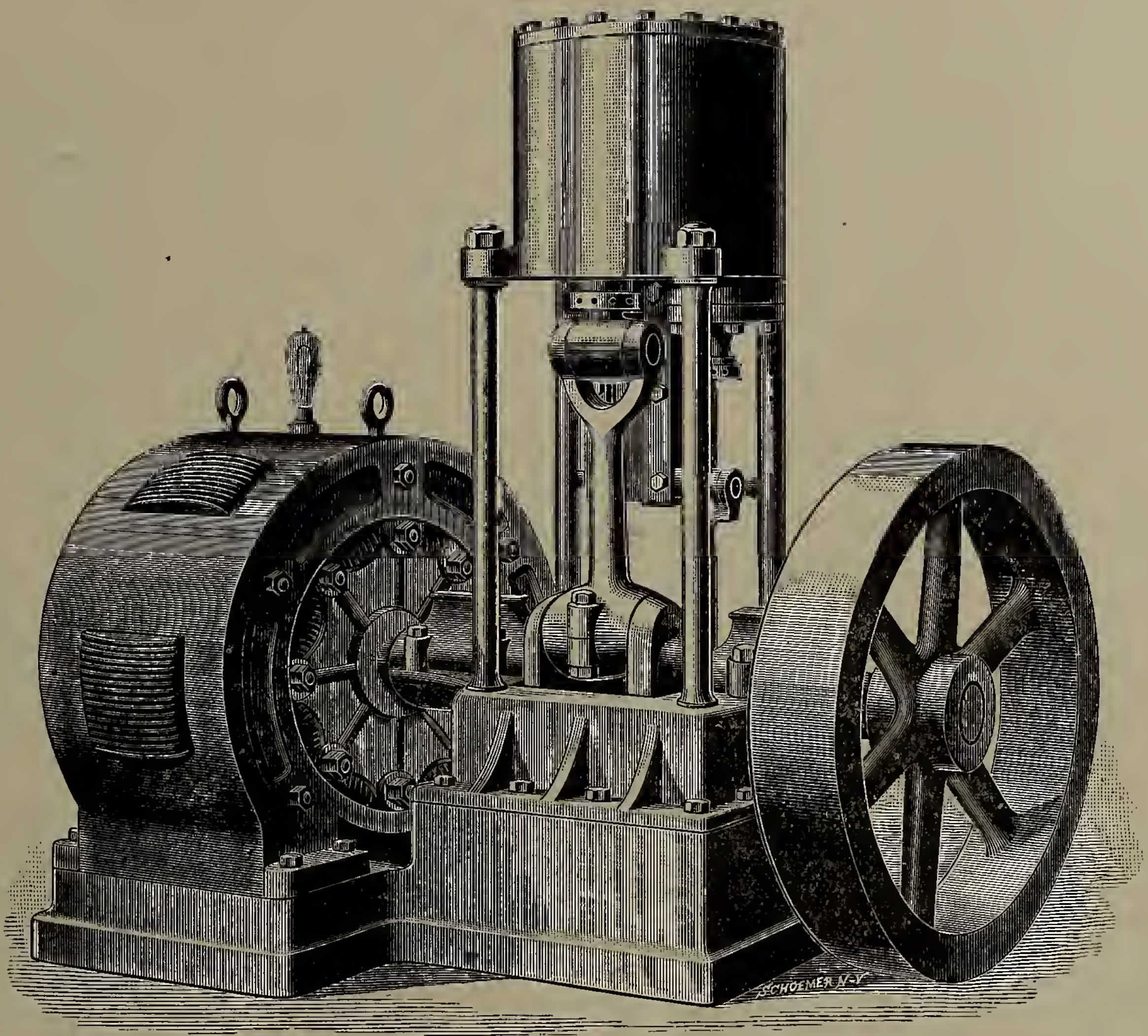

SCHOEMER N.Y.

FIG. I.—"RIKER" MULTIPOLAR DYNAMO AND ENGINE.

The accompanying illustrations show two forms of combinations of engine and dynamo for marine use. Fig. 1 represents a "Riker" multipolar marine dynamo coupled directly to the engine. The multipolar dynamo is designed to supply lights from 100 upward, and is said to give a light of uniform brilliancy under varying conditions of load. The dynamo and engine are both on the same bed-plate, which arrangement gives great stability and strength to the system.

The engine is finished in the best manner possible, and smooth running. While it is light in appearance, the quality of durability has not been sacrificed. Indeed, the combination gives the best possible results under the conditions.

What is true of this particular combination is also true of that shown in Fig. 2, which represents a "Riker" bipolar marine dynamo and engine combination. The engine and dynamo shafts are rigidly coupled and the space required for the installation, it will be noticed, is exceedingly small.

The dynamos in both combinations are of the slow-speed type. The bipolar machine is designed for plants of any number of lights up to 100, and its efficiency and construction are so well and favorably known that to dwell on it at this time with reference to these qualities, would seem superfluous. The Riker machines are celebrated for their electrical and mechanical efficiency.

The Riker Electric Motor Co. also supplies storage batteries, search-lights, electric launches and tenders, electric fixtures, and all the necessary apparatus and fixtures for complete electrical plants on ship-board.

Among the celebrated steam-yachts fitted out by the Riker Company may be mentioned the "Vamoose," "Linta," "Orienta" and "Truant," and the owners of these craft express themselves well satisfied with the performance of the electrical plants.

THE ST. LOUIS CONVENTION.

A meeting of the St. Louis Electrical Club was held on January 21 last for the purpose of considering plans for the entertainment of the members of the National Electric Light Association during the coming convention. By invitation several members of the Autumnal Festivities Association were present, and they expressed their opinion that their association would be glad to cooperate in the entertainment of the association. A representative of the Merchants' Exchange spoke in a similar vein with reference to that body. President James I. Ayer, of the National Electric Light Association, in his remarks stated that probably 300 visitors would be present on the occasion of the convention, and outlined some of the features of the meeting. The evening of

February 28, he said, had been assigned for an electrical exposition in Music Hall ; on the following evening, March 1, a banquet will probably be given. He laid special stress upon the appearance of Nikola Tesla, who would lecture before the meeting, which feature, he said, would give the meeting a world-wide interest. Every word uttered by Mr. Tesla, continued Mr. Ayer, is quoted in all lands and in all languages, and this lecture would attract the attention of scientists all over the world.

Financial and executive committees were named, Mr. J. A. J. Shultz, president of the Shultz Belting Co., of St. Louis, being appointed chairman of the former, and Mr. Louis Nahm chairman of the latter committee.

The club then proceeded to consider the establishment of a lunch counter, and the house committee was instructed to rent the room adjoining and establish a buffet. The idea is to make the club a sort of business exchange where members may meet for the transaction of business, and the lunch feature will, it is thought, attract many with whom they have business to perform. It was announced that a friend had given the club a pool table, and this would soon be added to the inducements. The hope was expressed that ultimately the club would be among the largest and most influential organizations of the kind in the city.

Saturday night was selected as the regular meeting night of the club.

The Onondaga Electric Company, of Syracuse, N. Y., will probably consolidate with the old company, as negotiations are being made with that end in view. Business has been stopped and the contract for the power-house, for which bids are in, has not as yet been let. As soon as an agreement has been reached business will be continued.

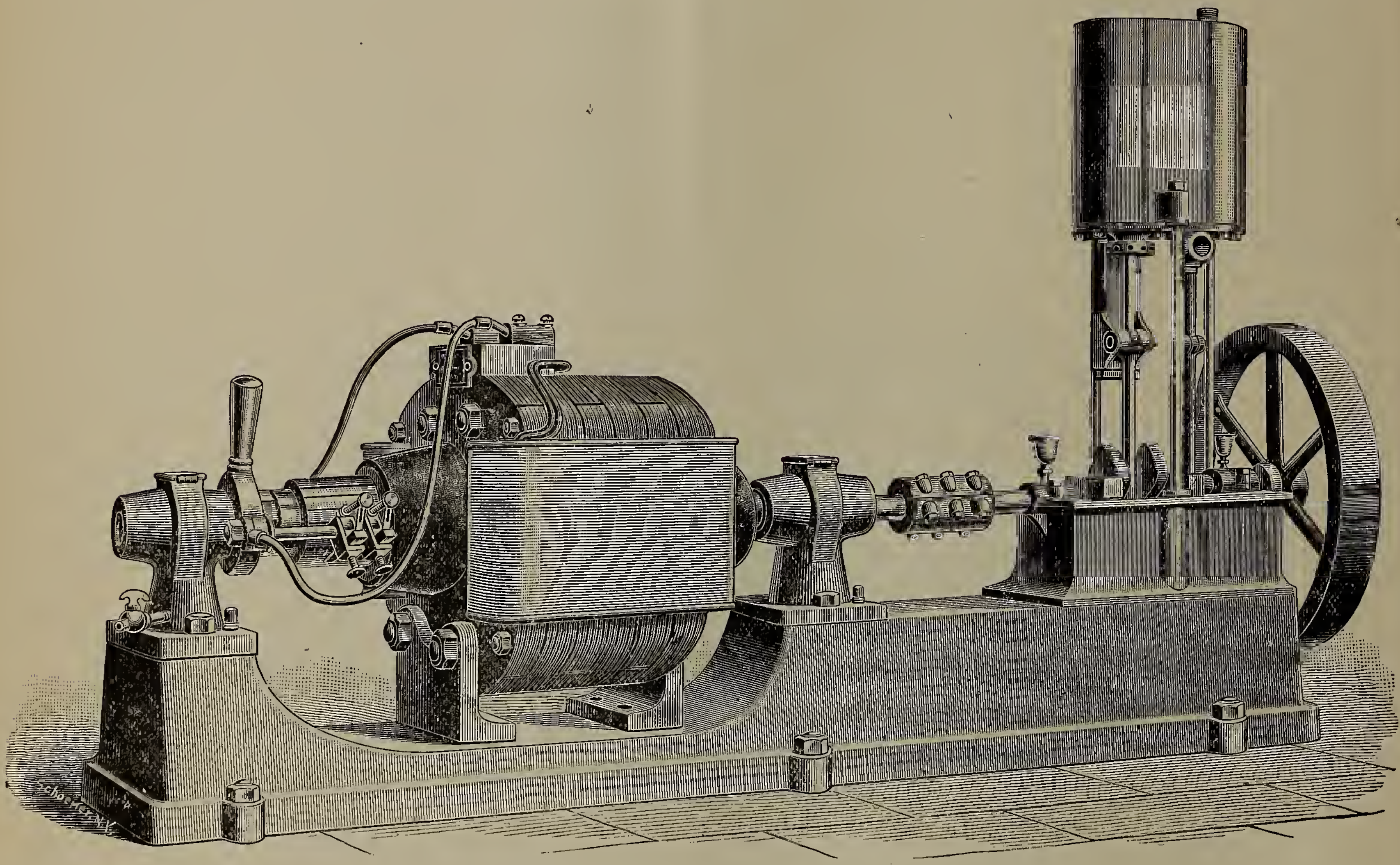


FIG. 2.—" RIKER " BIPOLAR MARINE DYNAMO AND ENGINE.

THE INCANDESCENT LAMP.*

BY PROF. ROSEBRUGH.

Until quite recently it has been the object of lamp dealers to procure long-lived lamps, thereby reducing the expense of renewals, hence being better able to compete with other illuminating agents. In order to procure this durable lamp the filament was made much stouter and in consequence lower in resistance. It was found that although these lamps lasted for several thousand hours, they require considerable current, therefore were not very economical. The aim of lamp manufacturers now became to obtain the greatest number of lamps per horse-power, that is, to get the greatest amount of light for the least expenditure of energy. To do this the filaments were made longer and finer, and by the after process of carbonization the resistance was considerably raised. For these and numerous other causes, the different types of lamps range in efficiency from two, and even as low as one and one-half, to six watts per illuminating candle-power, or, in other words, one lamp will give three times as much light as the other for the same expenditure of current. If these were all the data to be obtained, the problem of determining the best lamps to be used would be a simple one. But it is a well established fact that an incandescent lamp maintained at a constant voltage will invariably fall off in candle-power. This diminution in brightness is attended by an increase in the amount of energy consumed per candle-power of light, the change being especially marked in the earlier portion of the life of the lamp. This phenomenon appears to take place in all incandescent lamps of the present day, and more particularly in lamps of high economy.

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*Abstract of paper read at the convention of the Canadian Electrical Society, held at Toronto, Ont., January 25 and 26, 1893.

These changes may be ascribed to at least three causes, viz.: loss of vacuum; increase of resistance, due to the disintegration of the filament; and finally the deposition of the disintegrated carbon upon the inner surface of the lamp-bulb.

Recent elaborate tests go to show that although a lamp may commence with a very high efficiency, say at two watts per candle-power of light, during the first two hundred hours the lamp is likely to decrease uniformly to seven or eight candle-power, thereby only having an efficiency of five or six watts per luminating candle-power. After this point the falling off in candle-power and efficiency is not so marked, but continues until the carbon is at last consumed. This falling off in candle-power is decidedly unfair to the consumer, who is charged for the full rated candle of the lamp. Nor is it economical to the illuminating company, who are consuming as much if not more current than when the lamp was burning to its full brilliancy.

Taking all facts into consideration it would seem, according to our judgment, that the best lamp to procure for station work is one of moderately high economy; say of about 3.1 or 3.2 watts per candle-power of light. Having selected our lamp, it now remains for us to decide upon the most successful way of operating and taking care of them.

It is a well-known fact that the efficiency of an incandescent lamp increases very appreciably the more it is forced; that is, the number of watts required per candle-power of light becomes less the greater the voltage to which it is subjected. It is also well known that on the other hand the life diminishes very rapidly the more a lamp is thus forced. As the total cost of the light is increased by going to either of these extremes, of long life and poor efficiency on the one hand, and good efficiency with short life on the other, there must be some intermediate value for the life and the efficiency which would give the most economical results, considering both the cost of the lamp and the power required. Numerous different methods have from time to time been suggested and used to determine this point with more or less success. But they have all apparently led one to believe that a long life is a most desirable feature, so much so that extremely long-lived lamps were considered as great achievements in lamp-making. More recently the tendency has been to increase the efficiency slightly and to diminish the life. But it appears now from the very interesting deductions of Mr. O'Keenan that the most economical point, considering all the factors involved, is very materially different from what was generally supposed and that it is in fact cheaper to replace old lamps with new ones after a few hundred hours rather than to continue to burn the old ones. He shows that there is a point in the life of each make of lamps at which it will pay best to break the lamps. To this point he gives the appropriate name of "the smashing point."

Whether you accept these statements or not, lamp renewal is an important item in the expenses of an illuminating station and amounts to considerable, even in small isolated plants. It is therefore a question of momentous importance to be able to decide what kind of lamps are best to use, and what is the best way to manage them so as to secure the most satisfactory results, not only in regard to the financial interests of the illuminating company, but also that the public may get the best value for their money.

Having decided upon the best lamp to use, after giving due consideration to the various data supplied by different manufacturers, all of which should be received with the greatest of caution, the next thing to obtain is an absolutely steady current. A precisely even potential is one of the most essential requisites for obtaining any sort of satisfactory results with incandescent lamps. It is astonishing how little attention is paid to this important feature of incandescent lighting. Tests which we have made convince us that there are few stations in Canada which can boast of a potential which does not vary from five to fifteen volts either side of what it is supposed to be operated at. A raise of three volts in a hundred-volt lamp will reduce the life one-half. This change is much more marked in lamps of lower voltages. It is a wonder that lamps last half as long as they do, subjected as most of them are to such a range of potential, varying in many cases from one hundred to one hundred and twenty volts. We would most emphatically recommend that a man be datailed in every large plant or station to watch the pressure indicators and regulate the current accordingly. Also that the station be provided with a good portable voltmeter, so that the potential may be known at different points. If these regulations are strictly and promptly carried out there would be far fewer complaints about incandescent lamps.

This branch of the electric industry is launching out into new channels, and even now plays an important part in the service of man, not only in domestic spheres, but also in the scientific and other useful pursuits of life. Lamps can be had from a fraction up to several hundred candle-power, varying in size, shape, color and efficiency. Now that we have the Ries regulating socket, by which the light can be turned up or down without waste of current, the incandescent light is in every way superior and has every advantage offered by any other illuminating agent without their disadvantages, defects and impurities. May we not therefore conclude with all justice and honesty that the incandescent lamp is destined to be the light of the future?

ELECTRICAL SOCIETIES.

FRANKLIN ELECTRICAL SOCIETY.

Under the auspices of this society a course of interesting and instructive lectures is to be given at the Evening Trade School, 225 and 227 East 9th Street, New York city. These lectures are especially intended for young men interested in mechanical and scientific pursuits, and will be illustrated by experiments and stereopticon views. The dates and subjects of these lectures are as follows:

Saturday, February 11.—Electrical Transmission of Energy, by Newton Harrison, E.E.

Saturday, February 18.—The Earth in Past Ages, by E. S. Barney, C.E.

Saturday, February 25.—Chemistry and its Relation to Electricity, by Julian A. Moses.

Saturday, March 11.—Development of the Electric Arc Lamp, by Ernst V. Lallier.

Saturday, March 18.—Dynamo Electric Machinery, by W. Wallace Ker.

Mr. A. A. Hamerschlag, room 301, 136 Liberty street, is the secretary.

PERSONAL.

Mr. Edward Caldwell, who has for nearly three years held the position of associate editor of the *Electrical World*, has resigned to assume the editorship of the *Street Railway Gazette*, Chicago. Mr. Caldwell left for Chicago on January 27 to assume his new duties. He has many friends in the east, all of whom wish him success. During the past year and a half Mr. Caldwell had charge of the editorial department of the *World*. Mr. Caldwell was at one time connected with Sprague Electric Railway and Motor Co., and afterwards with the West End Street Railway Co., of Boston.

The Lee building, to be erected on the corner of Court and Pearl streets, Buffalo, is to be lighted by electricity. Mr. F. H. Loverin is the architect. This is to be the finest office building in Buffalo.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Altoona, Pa.—A company is being formed for the construction of an electric-light plant here.

Bangor, Pa.—The streets here should be better lighted, and the question of lighting them by electricity is being discussed.

Cuero, Tex.—A new company known by the name of the Cuero Electric Light, Power and Telephone Company has been incorporated here. Otto Starker is interested.

Lisbon Falls, Me.—The streets of this village are very poorly lighted, and the residents are anxious to have electric light.

Marshfield, Mass.—The city council will receive bids for the establishment of a plant to supply 33 arc lights of 2,000 candle-power for city lighting. Bids will be closed at noon, March 2.

Newport, R. I.—The council has received a petition for the extension of the Broadway electric lighting to the mile corner.

Newark, O.—There are no electric lights in this city and public sentiment is in favor of having a plant installed. There is a good chance for an electric light company here.

North Attleboro, Mass.—There is a project on foot to establish a municipal electric-light plant here.

Ida Grove, Ia.—An electric-light franchise has been granted to J. W. Reed and others.

Indianapolis, Ind.—Bids will be received by the County Commissioners for an electric plant here.

Pennsburg, Pa.—The residents of this city are anxious to have the streets lighted by electricity.

Phœnixville, Pa.—An electric-light plant is to be erected here by the Schuylkill Valley Illuminating Company and wires will be run to Royerford and Spring City.

Pierce, Mo.—It is said that the electric-light plant here will soon be enlarged.

Tower, Minn.—Preparations are being made by the Tower Electric and Telephone Company for the building of a new station, which will be located about midway between the Iron Range brewery and the Iron Range depot.

NEW CORPORATIONS.

Alton, Ill.—Alton Electric Street Railroad Company. Capital stock, $250,000. Incorporators: Manning Mayfield, Henry G. McPike and John F. McGinnis.

Auburn, Me.—The Auburn Electric Motor Company. Capital stock, $50,000. Incorporators: C. H. Lucas, Walter F. Brown, Henry J. Davis and J. P. Hutchinson.

Bridgton, Me.—The Bridgton Electric Light and Power Company. Capital stock, $20,000.

Columbus, Kan.—Columbus Electric Company. Capital stock, $10,000. Incorporators: B. F. Hogg, E. M. Tracewell, H. R. Crowell, A. H. Crowell and F. D. Crowell, of Columbus.

Cuero, Tex.—Cuero Electric Light, Power and Telephone Company. Capital, $15,000. Incorporators: Otto Starker, Emil Leonhardt, A. F. Palmine, Louis Kellar and Paul Bornbluth.

Hartford, Conn.—B. Rowland Allen, Henry A. Botsford, and Arthur Perkins, of this city, have presented a petition for the incorporation of a street railway company here.

The Enfield and Longmeadow Electric Railway Company has been incorporated.

Lancaster, Pa.—The Lancaster and Manheim Electric Railway Company. Capital, $250,000. Incorporators: John A. Coyle, Dr. M. L. Herr, Jacob B. Long, Walter M. Franklin, and J. W. B. Bausman, of Lancaster.

Lincoln, Neb.—The Metropolitan Gas and Electric Light Company. Capital, $200,000. Incorporators: J. H. McMurtry, K. K. Hayden, E. Finney, of Lincoln; Thomas J. Ross, of Chicago, and A. M. Coffman, of Boston.

New Castle, Me.—The Pemaquid, Damariscotta and New Castle Street Railway Company. Capital stock, $300,000. Incorporators: W. E. Lewis, W. S. Bromera, W. S. Fuller, George W. Ellis, Eugene Sproul, Augustus Fossett, Robert H. Cram, Alvin A. Fossett, Arad Fossett, H. M. Heath, O. A. Tuell, H. H. Chamberlain, F. H. Boynton, J. E. Nichols and W. F. Sawyer.

Newton, Mass.—The Newton and Brighton Street Railway Company. Capital, $100,000.

Norfolk, Va.—The Metropolitan Development Company. Capital stock, $100,000.

Philadelphia, Pa.—The Schyulkill Valley Illuminating Campany. Capital $30,000. Incorporators: L. Knowles Perot, Charles Perot, William C. Hannis, Philadelphia; Francis Finimore, W. Davids and Richard W. Davids, Lower Merion.

Rockport, Mass.—The Rockport Street Railway Company. Capital, $100,000. Incorporators: John H. Cunningham, Albert D. Bossom, of Chelsea; E. P. Shaw, of Newburyport; W. B. Ferguson, of Malden, and others.

Wellesley, Mass.—The Wellesley and Boston Street Railway Company. Capital, $100,000.

Worcester, Mass.—The State Central Railway Company. Capital, $450,000. Incorporators: Samuel Winslow, Thomas M. Rogers, Worcester; A. H. Howe, Marlboro; Frederick T. Chase, Webster; C. H. Nelson, Grafton; Charles O. Green, Shrewsbury; Samuel Wood, Northboro; George O. Brigham, Westboro; W. B. Ferguson, Boston; John R. Bullard and Thomas T. Robinson, Dedham.

EXTENSIONS.

Bridgeport, Conn.—The Bridgeport Horse Railway Company has asked for permission to extend its lines.

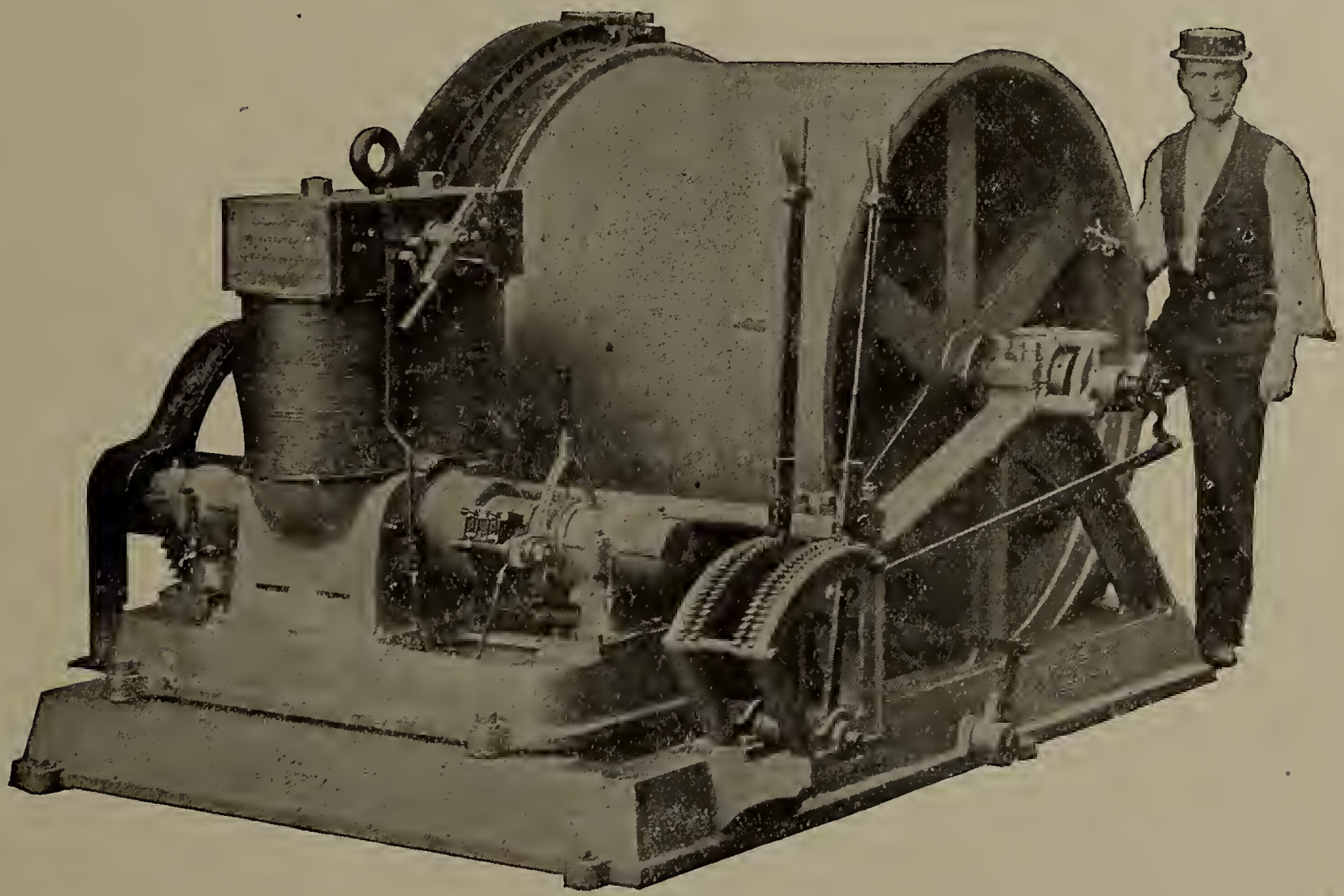
Chester, Pa.—The Union Street Railway Company proposes to extend its lines on Seventh street.

Fitchburg, Mass.—The Fitchburg and Leominster Street Railway Company proposes to extend its tracks to Clinton.

Hornellsville, N. Y.—It is expected that the Hornellsville electric road will be extended to Alfred Centre.

NEW MINING-HOIST.

A new electrical mining hoist has been recently brought out by the General Electric Company which is an advance in the manufacture of this class of apparatus. It is constructed with the especial object of obtaining a wide range of hoisting speed, to which end the controlling apparatus has been carefully perfected. The drum is of unusually large diameter and is connected by an intermediate gear to the armature-shaft of a 25-kilowatt, (30 H. P.) motor of the General Electric Company's regular bi-polar type. The controller for the motor, which is not shown in the cut, is similar to that used in street-railway service, and is erected on a separate support conveniently within reach of the operator and directly to the right of the levers. These can then be operated with the left hand, and the controlling switch with the right. The series method of electrical control is adopted, the speed being increased or decreased to meet requirements by the movement of the switch-handle. The hand-brake is of the band type, lined with wood, and extends almost entirely round the drum. The drum is thrown into operation by a clutch operated by the second lever.



NEW MINING-HOIST.

The range of speed obtained on this hoist is very wide. It is designed to raise loads of 1,300 lbs. at the rate of six hundred feet a minute, and has successfully accomplished this. It can also raise loads of 100 lbs. at a speed not exceeding 20 to 30 feet a minute.

The motor is erected on its own bed-plate bolted to the bed-plate of the hoist proper, the whole apparatus occupying comparatively little space owing to its compact construction.

This hoist, by its specially advantageous features, should command the attention of mine managers and superintendents anxious to procure the most efficient apparatus.

In the cases of the Brush Electric Light Company against the Queen City Electric Light Company, of Cincinnati, O., and the same company against the Jones Brothers' Electric Light Company, the Supreme Court has rendered decisions in favor of the defendants.

NOTES OF GENERAL INTEREST.

Some malicious individuals have been making trouble with the electric lights at Long Branch, N. J., by stealing the carbons and breaking globes.

The Carondalet Electric Light Company, of Carondalet, Mo., has been sued by Thomas A. Smith for $2,204, for breach of contract to deliver ice.

The Chicago Edison Company, of Chicago, Ill., has been granted permission to build a new power-house. The building will cost about $250,000.

Suit has been brought against the city of Amsterdam, N. Y., by the Amsterdam Arc Light Company. The company has checks against the city, but it cannot get them cashed except at a discount, there being no money in the treasury, it is said.

The Edison Electric Illuminating Company, of Brockton, Mass., has changed hands, and is now under the control of Brockton men. The new company has elected the following officers: President, Wallace C. Keith; vice-president, Horace Richmond; treasurer, Fred B. Howard; clerk, Fred P. Richmond.

Negotiations have been concluded by the Phœnix Electric Company, Duluth, Minn., with the Peoria Electric Light Company, for the purchase of the plant of the latter company, which will be removed to Duluth. The company will increase its capital stock to $250,000, and will manufacture electric motors, dynamos and generators.

Since the lamp decision the General Electric Lamp Works at Harrison, N. J., have been overwhelmed with work, and the operating force has been largely increased in consequence. It is said that the force has been increased by about 400 hands, a great majority of which are girls, and every day additions are made. The company has been advertising for girls, and every morning a long row of female candidates is in waiting for the opening of the gates. As soon as the gates were opened a decidedly undignified scramble was made to "get there first," with the result of more or less damage to personal raiment and appearances. Each morning the scramble became more vigorous and lively, until it assumed the proportions of a small riot, and on January 26 it was necessary to ask police aid to preserve order.

ELECTRICAL EXECUTIONS IN MISSOURI.

A bill was presented in the Missouri House of Representatives on February 1 providing for the substitution of electricity for hanging as the mode of inflicting capital punishment in that State. The bill is said to be almost a duplicate of the law in New York State, but it is said that the chances of its passage are not considered good.

PHILADELPHIA NOTES.

I met Mr. J. D. McIntyre, of the Electric Engineering and Supply Co., of Syracuse, N. Y., here. He states that his company's World's Fair double-pole switch is taking very well, and it is doing a large trade in it.

C. E. Bibber, of the Consolidated Electric Mfg. Company, Boston, was in Philadelphia and vicinity this week and was doing a good business, especially in Lyon brake handles which seem to be as much favored here as everywhere else.

Vallee Bros. & Co., 17 North 6th street, are doing a nice business and seem to be satisfied with the outlook for trade. Their electric-light specialties and fixtures make an excellent display. The fixtures are of unique and rich design.

I met here Mr. F. C. Randall, who represents the J. G. Brill Company of this city in the Eastern States. Mr. Randall has taken several large orders for electric cars in his territory. He is a regular steam-engine in business, and a quadruple-expansion one at that.

The Price Railway Appliance Company, 125 South Fifth street, has on exhibition a sample of the Price double girder joint, which was described with other track devices in our issue of December 31, 1892. These devices seem to be meeting with much favor.

C. S. Solomon & Co., 1015 Sansom street, are installing an electric-light plant in the establishment of Burt Bros., furniture manufacturers. This plant consists of a Mather dynamo of 250 lights capacity, run by a Power engine. The firm has also put in several other similar plants recently.

The Helios Electric Company, of Philadelphia, is making 1,000 Helios arc lamps for incandescent circuits for the Mount Morris Electric Light Co., of New York city. Mr. H. Stawson, of the Mount Morris Co., is agent for the lamp and the Stanley Electric Company, Pittsfield, Mass., is the Eastern agent for the Helios Company.

W. H. Weston & Co., 838 Filbert street, are kept busy day and night in the manufacture of their various apparatus, so great is the call for them. Those who wish switches, switchboards, stage and field regulators, or especial electrical work done, should write to this firm for estimates. On the 1st of May the firm expects to locate in larger quarters.

The Cutler Electrical and Manufacturing Co., 27 South Eleventh street, is bringing out some new specialties. These include a flush key-switch for electric lights, and an automatic electric-light door-switch, made to set in the jamb of the door. These devices are very convenient, and are excellently adapted to use in hotels, club-houses, private and public buildings.

The Novelty Electric Company, 54 North Fourth street, reports an excellent trade in its new specialties in incandescent lamp-shades, clamps, reflectors and holders. The insulating paint made by this company is second to none, and there is a large demand for it. The Novelty wire gauge continues in general favor, and the demand keeps steady. Large orders for these convenient devices are being filled every day.

G. W. Lord, 316 Union street, of Boiler Compound celebrity, continues in the enjoyment of an excellent trade. But this is easily accounted for when the value of this compound is taken into consideration. Mr. Lord is a practical chemist and inventor, and the efficacy of his compound is acknowledged and accorded the confidence of manufacturers throughout the United States and foreign countries. The Lord Boiler Compound is made exclusively by Mr. Lord himself.

Morris, Tasker & Co., Incorporated, 222 and 224 South Third street, state that the electric railway business must be rushing, as they are overwhelmed with orders for their iron tubular poles, which are so much desired by electric railways. In our issue of December 31, 1892, we gave an illustrated article on these poles. The merits of this house's goods are well known wherever there is a street railway. The poles are made of wrought-iron pipe and calculated to meet every requirement imposed in practice.

Queen & Co., incorporated, Philadelphia, report a steady demand for their portable photometer, which instrument accurately measures the candle-power of incandescent lamps, and can be used wherever desired. It is very important from an economical standpoint for a central station manager to use lamps that give the greatest illumination for energy consumed, and this convenient apparatus enables comparisons of different types to be quickly made. When a customer complains of poor light, an impartial test will settle the dispute much more quickly than words, and there is no appeal. The makers issue descriptive circular No. 295, which gives further particulars. Interested parties should ask them for a copy. This firm will shortly put upon the market some new instruments for students, and some medical outfits and small batteries for testing. W. T. H.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, February 4, 1893.

Mr. F. H. Angell, of the Utica Mfg. Co., Utica, N. Y., was in town last week, and gave us a call.

T. J. Murphy, 136 Liberty street, has lately received an order for two 6 x 4 foot marbleized Tennessee slate switchboards. One is for Schwarzschild & Sulzberger on First avenue and the other for the New York Cotton Exchange.

The Law Battery Co., of 85 John street, city, has just issued a new catalogue of its electro-medical apparatus, including galvanic cells, current controllers, Faradic coils, Milliam—Meters, etc. The front cover is an imitation of that of a United States patent, and is very unique and attractive.

The Edison Electric Illuminating Co. of Brooklyn on January 27 sent notices to users of electric lights in that city to the effect that it had the exclusive right to sell incandescent lamps in the city of Brooklyn, and that all persons using or selling incandescent lamps in the city not bought of the company were infringers.

The Riker Electric Motor Co., 45 and 47 York street, Brooklyn, has just issued an elegant catalogue of electrical apparatus made by it for marine use. The catalogue describes and illustrates directly connected engine and dynamo plants, standard dynamos and motors, search-lights, storage batteries, electric launches and tenders, fixtures and some views of the work and craft equipped by the company.

The Board of Electrical Control on February 1 adopted the report of the engineer prescribing a certain district in which all overhead wires must be placed underground. The boundaries of this district are from the Battery to 59th street, between Eighth avenue and Greenwich street, and West street and Eleventh avenue, the streets and avenues named not being included in the operation of the order. The wires must come down within 90 days.

Hatzel & Buhler, 114 Fifth avenue, New York city, electrical engineers and contractors, have the contract for wiring and equipping the new Herald building, Broadway between 35th and 36th streets. There will be a total of 2,600 incandescent lamps of 16 C. P. each. The Habirshaw wire and vulca ducts for carrying the wires are used. They will put in all the switches and other appliances, which include one large marbleized slate distributing board containing 30 knife-switches. Around the cornices of the room will be placed a number of owls with automatic arrangements, so that every half hour their eyes will blink. On each side of the building, outside, near the top, there will be a large sign made of 16 C. P. incandescent lamps; in front of the building over the entrance there will be a smaller sign. Over 400 lamps will be used on the large signs. The same firm is installing a 1,000-light plant in the McLaughlin Apartment House, 65th street and Fifth avenue.

W. T. H.

ELECTRICAL STOCK QUOTATIONS.

The following are the latest prices for electrical securities in New York, as quoted by Geo. B. Ellery, financial editor Electrical Age.

Names of Companies.	Capital.	Par.	Price.
American Dist. Tel., N. Y.	3,825,000	100 00	59 00
American Telegraph and Cable	14,000,000	100 00	92 00
American Visual Telegraph Co.	500,000	100 00	†75 00
Bell Telephone	17,000,000	100 00	209 00
Bell Telephone 7s	2,000,000		*113
Boston Electric Light Co	1,500,000	100 00	117 00
Brooklyn Edison Electric Light	1,500,000	100 00	113 00
Brooklyn Edison Electric Light, 5s	500 000		*100
Brooklyn Citizens' Electric Light	500,000	100 00	150 00
Brooklyn Municipal Light	500,000	10 00	17 00
Brush Elec. Lt. Co. pref., Balto	600,000	100 00	80 00
Brush Elec. Lt. Co., Balto., 5s	200,000		*105
Brush Elec. Ill., N. Y.	1,000,000	100 00	30 00
Brush Elec. Ill., 6s, N. Y.	300,000	100 00	*102
Brush Elec. Co., Parent		50 00	40 00
Brush-Swan E. L. Co. of N. E.	2,000,000	100 00	20 00
Burrell Electric Signal Co., N. Y.	500,000	20 00	10 00
Chattanooga Elec. Lt. Co., Tenn., 6s	200,000		*101
Chattanooga Elec. Lt. Co., Tenn.	100,000	100 00	92 75
Chicago Gas	25,000,000	100 00	92 00
Columbia Chronophone Co., Phila	500,000	25 00	35 00
Commercial Cable Co	7,716,000	100 00	185 00
Cons. Gas Co., N. Y.	35,430,000	100 00	136 00
Cons. Subway Co., N. Y.	3,000,000	100 00	25 00
Detroit Elec. Lt. & P. Co	300,000	25 00	14 00
Detroit Elec. Lt. & P. Co. 6s.	300,000		*101
Detroit Electrical Works	1,000,000	10 00	4 50
Direct U. S. Cable Co., Ltd	6,400,000	100 00	50 00
Edison Elec. Ill. 5s, N. Y.	3,250,000		*122
Edison Elec. Ill., Lebanon, Pa	80,000	10 00	13 75
Edison Elec. Illuminating, N. Y.	6,500,000	100 00	125 00
Edison Electric Light Co., Phil	2,000,000	100 00	105 00
Electric Protection Co., N. Y.	100,000	100 00	75 00
Elec. Sup. & Con. Co., N. Y.	120,000	15 00	16 00
Electrical Forging Co	2,000,000	100 00	85 00
Elmira Municip. Imp. Co., 5s	1,800,000		par
Erie Telephone	4,800,000	100 00	50 00
Fort Wayne Elec. Co	4,000,000	25 00	13 00
Franklin Electric Co., N. Y.	5,000,000	100 00	†83 00
Fremont E. L. & P. & Gas Co., O.	95,000	100 00	102 50
General Electric Co.	50,000,000	100 00	111 00
General Electric Co., 5s	7,931,000	10 00	*100
General Electric pret.	4,223,700	100 00	117 00
Great West. Elec. Sup. Co. pref. 8s	350,000	10 00	10 00
Guarantee Identification Co., N. Y.	50,000	50 00	40 00
Hickory Electric Co., N. C.	12,000	100 00	112 00
Interior Conduit & Ins. Co., N. Y.	1,250,000	100 00	75 00
Int. Okonite, Limited	1,700,000	50 00	49 00
Laclede Gas Co	7,500,000	100 00	25 00
Laclede Gas pref.	2,500,000	100 00	74 00
Laclede Gas 5s.	10,000,000		*87
Law Telephone	400,000	100 00	96 00
Livingston E. Lt. Co., Mont., 6s.	30,000		*92
Marshalltown Elec. Co. 6s. Iowa	65,000		*98
Marysville L. & W. Co. 6s, Ohio	60,000		*98
Metropolitan Elec. Signal Co., N. Y.	1,500,000	100 00	35 00
Metropolitan T. & T., 5s	2,000,000		*103
Metropolitan Traction			148 00
Morristown L. H. & P. 5s, N. J.	30,000		*102
Morristown L. H. & P.	50,000	100 00	101 00
Nat'l Elec. Manuf. and Const. Co., N. Y.	50,000	100 00	101 00
N. E. Tel. & Tel. Co	10,394,600	100 00	60 00
N. Y. and N. J. Tel. and Tel. 5s	1,500,000		*98
N. Y. and N. J. Telephone Stock	2,535,000	100 00	98 25
N. Y. Storage Battery	100,000	100 00	96 00
North American Railway Co	39,767,200	100 00	10 50
Postal Telegraph	10,000,000	100 00	81 00
Peninsular Elec. Lt. & P. Co., Va.	30,000	10 00	9 50
Pettingell Andrews Co., Boston	200,000	25 00	30 00
Pittsburg Reduct. Co., Aluminum	1,000,000	100 00	105 00
Queen & Co., Phila.	600,000	100 00	100 00
Rockaway Elec. Light	50,000	100 00	40 00
Sawyer-Man Elec. Light Co., N. Y.	125,000	100 00	100 00
Shaver Corporation, N. Y.	2,000,000	100 00	75 00
Short Elec. Ry. Co., Cleveland, O.	5,000,000	10 00	8 00
Standard Ug'd Cable Co., N. Y.	1,000,000	100 00	80 00
Suffolk Electric Co., Boston	300,000	10 00	10 50
Swan Incandescent	800,000	100 00	6 00
The Gamewell Fire Alarm Tel. Co.	750,000	100 00	100 00
The Hall Signal Co., N. Y.	1,900,000	100 00	100 00
The Hall Signal Co. pref., N. Y.	100,000	100 00	115 00
The Ongley Electric Co., N. Y.	250,000	100 00	85 00
The Siemens & Halske Co., Ill.	500,000	100 00	par
The Washington Wat. Pow., Wash.	1,500,000	100 00	90
The Wells & French Co., Ill.	600,000	100 00	par
T.-H. Electric Co. 5s, N. Y.	500,000	30 00	*101
U. S. Rubber Co.	13,481,000	100 00	46 00
U. S. Rubber Co. pref. 8s.	12,942,500	100 00	96 50
Western Union	100,000,000	100 00	98 50
Westinghouse Elec. & Manf. Co	7,000,000	50 00	37 00
Westinghouse Elec. Co. pref. 7s.	4,000,000	50 00	49 25
West Point W. Lt. & P. Co., Va.	25,000	100 00	101 00

*Per cent. †Registered stock.

FINANCIAL.

Now that the people have had the necessary experience and education in industrial securities through regular dealings at the Stock Exchange, where such things should, in the interest of all concerned, be centred and the general confidence obtained, would it not be a most desirable action on the part of the Exchange to make a rule to the effect that all securities listed should be obliged to report annually or semi-annually, as may be most convenient and conducive to business, their financial condition, on the same lines as required at present from the railway corporations? It is too late for such recklessness as seems to rule in the Distillery and Cattle Feeding Companies' private offices. Fifty years ago, when less than fifty inveterate old gamblers dealt in pools, corners and dead-sure things, with the sole idea of gambling with marked cards and using every trick and device except honesty, even prevaricating to and falsely advising members, male and female, of their own families to beat each other, the public numbered very few and did their business personally. They ruined the credit of Americans all over the world, and it is only lately that we are accepted as respectable business people. The times and methods have changed. It is no longer a question of sharp practice but a question of honor. A customer wires, writes or telephones to the Exchange and places his money on a commercial business basis in the hands of the broker, subject to the broker's judgment and knowledge, he being on the spot and posted. To deliberately abuse that confidence is not respectable business, nor should the official meetings of directors of public corporations be held after business hours in the private rooms of hotels to deliberate and pass on the disposition of millions of dollars belonging to the shareholders they are employed to represent. The Exchange can make a rule covering this, and should do it at once. The shareholders are the ever-changing public and are entitled to protection. There is no doubt electricity will soon enter largely and profitably into the manufacture and ageing of spirits, if it has not already done so. I have had many schemes offered, the owners claiming they could effect the same chemical changes in months that time requires years for, and their appliances afford a profit to all general electric shareholders. On all other points stocks have ruled strong and more than enough of them active to occupy the full day of the brokers and clients with mental labor which would "knock out" the hewer of wood and the drawer of water. Business has opened and kept pace this year fully up to expectations. Western Union straddles par every few days, and considerable money is being placed there as a permanent investment. Bell telephone remains over 200. Present holders appear supremely indifferent; they neither scare nor enthuse; non-shareholders look for an explosion that don't materialize; city fathers and a few legislators all over the land are drawing all sorts of ordinances to regulate the telephone business, but fail to disturb the serenity of the company. The automatic companies are doing their best to increase their business and succeed where they can get the right of way. The incandescent lamp manufacturers are beginning to have trouble. The General Electric Company is quietly spreading its net; it is the next strongest thing to death and taxes, and fully as hard to get out of if once in. I see that several local Edison companies are notifying those in the territory they serve to use their lamps only — quiet business. There is however a pot of money to be made in new arc lamps. These are now sold, or sent on trial, convertible in candle-power from 100 to 2,000 and with short stems, which are more desirable for inside lighting, and improved carbons lasting 8 to 16 hours. One of these companies with factory and all complete, with numerous orders in hand, is in the market offering any part of $40,000 of stock which should pay 25 % as there is 100 % profit on the lamps at regular rates. It has no bonds out. The new Westinghouse lamp I do not meet yet, but am patiently waiting. The latest in the electric bombs is a claim to the trolley antedating all others, and it may include all transportation of electric power.

FINANCIAL NOTES.

On January 25 one hundred and forty-three shares of stock of the Citizens' Electric Illuminating Co. of Brooklyn were sold at auction in Brooklyn, fetching $166 a share.

The Eddy Electric M'f'g Co., Hartford, Conn., has declared a quarterly dividend of 2½ per cent.

BALL ENGINES.

The Logansport Electric Light and Power Company started, a few days ago, its new 150 H. P. Ball engine, made by the Ball Engine Co., Erie, Pa., and its new 1,300 light compound-wound alternator, made by the Fort Wayne Electric Co., Fort Wayne, Ind.

Referring to the Ball engine, the Logansport *Daily Pharos* says:

"The Ball engine is now considered the best engine made, being equipped with the company's very latest improved governor, and other devices which will have a tendency to make the engine very economical. The engine and alternator made a run last night of 16 hours with perfect satisfaction in every particular. This new compound-wound alternating dynamo is the first of the very latest improved machines made by the Fort Wayne Electric Co., being self-regulating, sustaining a brilliant incandescence from the time the machine starts until it stops. Mr. D. M. Seymour, of the Ball Engine Co., Messrs. J. J. Muir and Driftneyer, steam experts and electricians of the Fort Wayne Electric Co., were present when the engine was indicated. Several cards were taken under various loads, which were very satisfactory, furnishing some very desirable data. Manager Seiter says that more improvements are contemplated."

TRADE NOTES.

The Sawtell Company, Boston, has removed its office to room 10, Shawmut building, 146 Franklin street. This company is the New England agent for renewal of burned-out lamps; also for the Springfield Motor and Switch Co., of whose goods the Sawtell Company carries a full line. Besides these, the Sawtell Company does all kinds of wiring and electric-light construction, and deals in all kinds of electrical supplies.

The Berlin Iron Bridge Co., of East Berlin, Conn., will build a new machine-shop for S. F. Hodge & Co., Detroit, Mich. The building will be 150 feet long and of the modern type, the central portion being 40 feet in width, controlled by a travelling-crane of 20 tons capacity, with a wing on each side 22 feet in width, the wings being two stories high. When completed it will be one of the best machine-shops in the Northwest.

The metallic packing made by the Katzenstein Company, 357 West street, New York city, has a world-wide reputation. The company's domestic trade has grown enormously during the past year, and its foreign trade has increased in proportion. This metallic packing is used very extensively by all of the most prominent shipbuilders in this country, and it will be used in the fitting out of the new Cunard steamers "Campania" and "Lucania." The packing is also furnished to a large number of steam-users in this country, including electric-light plants, cable and electric street roads, and for pumping machinery, etc., etc., and most of the transatlantic lines use it on their steamers.

The graphite paints, lubricants and graphite products of the Graphite Manufacturing Co., New York city, are gaining a substantial reputation. The graphite paints are said to afford first-class protection to wood or iron, and they are not in the least affected by either climatic conditions, moisture, acids, sulphur fumes, gases, salt or any chemicals. They are made in any color or shade. The paint is said to be a perfect protection for iron, and renders wood fireproof. It is said to be an excellent insulating paint for electrical purposes, and for painting mouldings in damp places it has no equal. It is adapted to all electrical work where a paint of this character is desired. The office of the company is in the World Building, New York, and Mr. Frank B. Hooper is the manager.

Among a number of sales recently made by the Chicago office of the Ball Engine Company, Erie, Pa., are the following: Calumet Electric St. R'y Co., Chicago, four 300 H. P. cross-compound electric-railway engines; Hammond Electric St. R'y Co., Hammond, Ind., one 150 H. P. steam-plant complete; H. D. Bentley, Freeport, Ill., one 35 H. P. steam-plant complete; Elmwood Electric Light Co., Elmwood, Ill., one 150 H. P. engine; Union Passenger Station, Chicago, one 125 H. P. engine; Keith Bros. & Co., Chicago, one 50 H. P. engine; Marengo Electric Light Co., Marengo, Ia., one 100 H. P. steam-plant complete; Scott & Royce, Griggsville, Ill., one 50 H. P. steam-plant complete; Western Light and Power Co., Chicago, one 300 H. P. engine; Englewood Electric Light Co., Chicago, one 500 H. P. cross-compound engine.

The F. P. Little Electrical Construction and Supply Co. on January 1 last assumed control of the business of F. P. Little & Co., who had been conducting an engineering and supply business at 141 Seneca street, Buffalo. The new company has arranged to occupy the entire building No. 135 Seneca street, and proposes to enter the supply business on a large scale. The business of the old firm will be carried on, the engineering department being conducted by a corps of skilful electrical engineers, backed by competent mechanics and electricians. Mr. F. P. Little has been retained as manager of the new concern, and his many friends wish him and the new enterprise much success. The officers of the new company are: P. P. Miller, president; John L. Williams, vice-president; F. H. Williams, treasurer; F. P. Little, secretary and general manager.

The Electrical Age's Illustrated Record of Patents.

Issued January 31, 1893.

490,641. Insulating Compound. Mathew H. Devey, Chester, Pa. Filed Jan. 30, 1892.

490,678. Apparatus for Electrically Treating the Eyes. William A. Price, Iowa Falls, Iowa. Filed Sept. 24, 1892.

490,679. Apparatus for Electrically Treating the Ear. William A. Price, Iowa Falls, Iowa. Filed Sept. 29, 1892.

490,684. Automatic Alarm Device. George W. Schilling and John G. Haslam, Philadelphia, Pa. Filed June 18, 1892.

490,690. Railway-yoke. Morris S. Towson, Cleveland, Ohio, assignor to the Love Electric Traction Company, Chicago, Ill. Filed Oct. 10, 1892.

490,698. Electrical Time-Indicating Apparatus. Edward Weston, Newark, N. J. Filed June 16, 1891.

490,699. Recording-Ammeter. Edward Weston, Newark, N. J. Filed March 18, 1892.

490,700. Electrical Measuring-Instrument. Edward Weston, Newark, N. J. Filed Mar. 29, 1892.

490,725. Electrical Pressure-Indicator for Steam-Gauges. Edward G. Smith, San Jose, Cal. Filed July 6, 1892.

490,744. Electric Time System. William F. Gardner, Washington, D. C. Original application filed Dec. 13, 1888. Divided and this application filed Sept. 4, 1891. Patented in France.

490,746. Electric Switch. Jacob S. Gibbs, Hartford, Conn., assignor to the Perkins Electric Switch and Manufacturing Company, same place. Filed Nov. 1, 1892.

490,753. Secondary-Battery Electrode. Harry G. Osburn, Chicago, Ill. Filed Nov. 21, 1891.

490,755. Connector for Electrical Conductors. George L. Russell, Middletown, Conn., assignor to the Schuyler Electric Company, of Connecticut. Filed Aug. 12, 1892.

490,760. Electrical Measuring-Instrument. Edward Weston, Newark, N. J. Filed Oct. 3, 1892.

490,761. Electrical Signalling System. Adoniram J Wilson, Port Chester, N. Y., and Wilmer W. Salmon Chicago, Ill., assignors to the Hall Signal Company of Maine. Filed Sept. 14, 1892.

490,762. Electric-Circuit Breaker. Edward M. Bentley, Boston, Mass., assignor to the General Electric Company of New York. Filed Nov. 19, 1892.

490,810. Dynamo-Electric Machine or Electric Motor. Robert Lundell, Brooklyn, assignor of two-thirds to Edward H. Johnson, New York, N. Y. Filed April 22, 1892.

490,839. Thermal Circuit-Closer. Elihu Thomson, Swampscott, Mass. Filed Oct. 6, 1892.

490,840. Composition for Soldering Aluminum. Georg Wegner, Berlin, Germany. Filed April 20, 1892.

490,841. Process of Electroplating Aluminum. Georg Wegner, Berlin, Germany. Filed May 5, 1892.

490,870. Electric Burglar-Alarm. Warren H. Carr, Bath, Me., assignor to himself and James W. Wakefield, same place. Filed Sept. 22, 1892.

490,882. Telethermometer. Howard B. Payne, Chicago, Ill., assignor of one-half to David B. Van Slyke, same place. Filed May 20, 1892.

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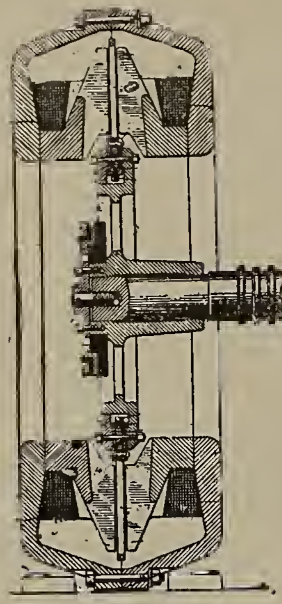
HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician.

PATENTS—Continued.

490,891. Electric Warming-Bottle. Thomas Ahearn, Ottawa, Canada. Filed Sept. 8, 1892.

490,903. Combined Gas and Electric-Light Fixture. Francis X. Gartland, Philadelphia, Pa. Filed Jan. 23, 1892.



490,810.—DYNAMO-ELECTRIC MACHINE OR ELECTRIC MOTOR.

490,917. Switch and Safety-Fuse. Elmer P. Morris, Boston, Mass., assignor to the Thomson-Houston Electric Company of Connecticut. Filed Feb. 11, 1892.

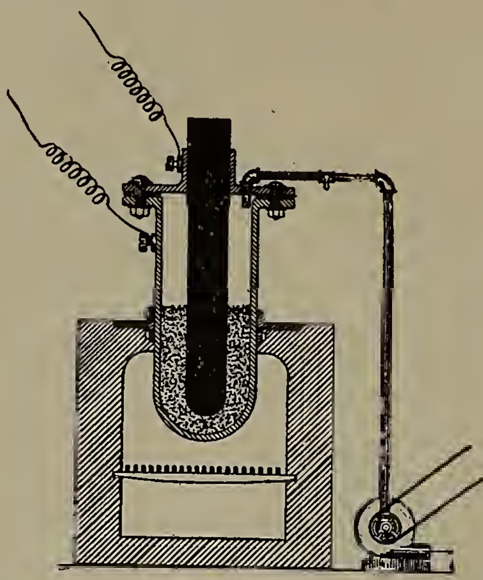
490,948. Electric Belt. John W. Cummings, Gold Hill, Nev. Filed July 27, 1892.

490,953. Art of Generating Electricity. Thomas A. Edison, Menlo Park, N. J. Filed Nov. 1, 1883.

490,959. Coupling of Dynamo-Electric Machines in Parallel. Albert Gay, London, England. Filed Jan. 11, 1892.

490,975. Electric Railway. Edward W. Mitchell, Covington, Ky., assignor to the Mitchell-Thompson Underground Electric Conductor Company, of West Virginia. Filed June 23, 1892.

490,992. Electric-Arc Lamp. James Sugden and Wallace J. L. Sandy, London, England, assignors to Charles Henry Freedman, Frank West Suter and Harrington Wyman, same place. Filed July 13, 1892. Patented in France and in England.



490,953.—ART OF GENERATING ELECTRICITY.

491,004. Electric Stop-Motion for Knitting-Machines. Winslow M. Bell, Milton, N. Y. Filed Dec. 18, 1890.

491,014. Trolley-Wheel. John J. Goetz, Covington, and John A. Smith, Dayton, Ky., assignors to themselves, and Harvey M. Littell, Cincinnati, Ohio. Filed May 20, 1892.

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ELECTRIC LIGHTS AND MUNICIPAL OWNERSHIP.

In another column we give an article on the municipal ownership of electric-light plants. The subject is becoming one of importance. Besides the cities mentioned in that article as now considering the advisability of this control may be mentioned Minneapolis and Detroit. Mayor Eustis of the former city has recommended the agitation of the question, though at present they have a five years' contract with a private corporation. In Detroit the question has been agitated for several years. Mayor Pingree has been fighting for municipal control of electric lights for four years. The private lighting companies, both gas and electric, have opposed him, and last year they succeeded in getting a bill through the Michigan legislature which provided in effect that cities of more than twenty-five thousand inhabitants be prohibited from owning their own electric lighting plants. A law similar in effect was also passed in Massachusetts. Such methods of tampering with legislation will create a sentiment in favor of municipal lighting that will before long strongly react upon those seeking at the present time to be benefited thereby. A free and open discussion of this question is what is needed. If a community decides to have municipal ownership, let them have it; if a community decides to let the privilege out to private corporations, let them do so; but at all events do not restrict one section of a State by State legislation just because another section deems it inexpedient or inadvisable to so act. In other words, this is a matter of local concern, and the local authorities ought to be unrestricted by State legislation.

SPECIAL TRAIN FOR ST. LOUIS.

Elsewhere in this issue will be found some information regarding transportation from New York city to St. Louis for delegates to the convention of the National Electric Light Association. The meeting, which will be held on February 28, March 1 and 2, promises to be one of extraordinary interest and value to its members, and the attendance will likely be of unusual size. The delegates from New York and the East will travel through the country in regal style. A special train with all the modern conveniences of railroad travel, including electric lights, will convey them to the convention city. The train will leave New York at noon on Sunday, February 26, and is due at St. Louis at 5:30 P. M. Monday, February 27.

AGAINST THE W. J. JOHNSTON CO.

In the case of the W. J. Johnston Co. against the Electrical Age Publishing Company of New York, in which the former sought to restrain the latter from changing the name of its paper to THE ELECTRICAL AGE, and from using representations of certain devices and combinations of the same on its title-page, was decided against the plaintiff, with costs, by Judge Andrews. An appeal was then taken to the general term, which also decided against the W. J. Johnston Co. with costs. After these unfavorable decisions, they applied to the court for leave to discontinue their action without paying any costs, but Judge Andrews disposed of this as follows: "I think the plaintiffs should be required to pay the full bill of costs, as a condition of being allowed to discontinue."

DEATH OF DR. NORVIN GREEN.

Dr. Norvin Green, president of the Western Union Telegraph Company, died in Louisville Ky., February 12, at the age of nearly 75 years. He was born in New Albany, Ind., April 17, 1818. He succeeded the late William Orton to the presidency of the Western Union Telegraph Company on the death of the latter in 1878. It is reported in this connection that General Thos. T. Eckert will probably succeed Dr. Green as president of the telegraph company.

AUTOMATIC SELF-CONTAINED ENGINE.

Concurrent with the development of electric lighting has been that of the steam-engine. The engine that was regarded as nearly perfect before electric lighting became an established industry, was proved, by the critical test of electric-light service, to be far below what it was supposed to be. Absolute steadiness was soon found to be wanting in even the best of steam-engines, and in order to operate an electric-light plant successfully it was essential that the engine should run with extreme steadiness. To meet these requirements engineers at once applied themselves to the solution of the problems thus presented, with the result that there are now on the market various makes of engines that fully come up to the electric-light standard of requirements.

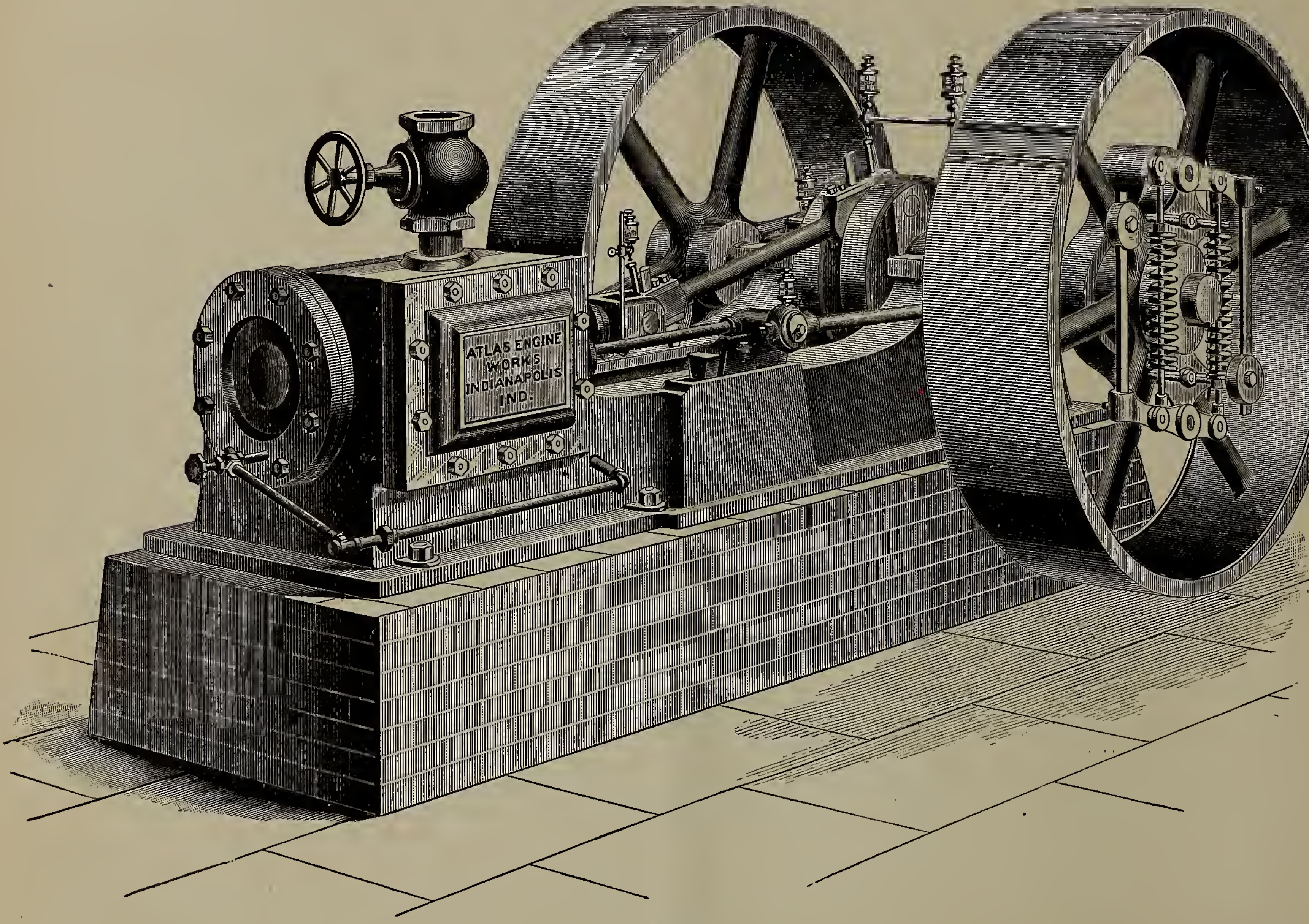


FIG. I.

Among these may be mentioned the engines manufactured by the Atlas Engine Works, Indianapolis, Ind. These engines are self-contained, and the company claims that they represent greater value for their cost than can be said of any other engine made in the United States. As an evidence of the popularity of these engines it may be remarked that there are 9,000 of them in actual and regular use through the country.

Fig. 1 represents the automatic self-contained engine, and is especially adapted for electric lighting and other close work. It is a solid piece of work, with long bearings and large pins, and can be safely run to a higher speed than can be done with common engines. The eccentric is hung rigidly, not liable to wear out of line, and yet is under perfect control of the weights and springs of the governing mechanism.

Each engine is furnished with a wrought-iron main shaft, two band-wheels, automatic shaft governor, balanced slide-valve, stop-valve, automatic sight feed cylinder lubricator and connections, bracket wire oilers for cross-head pin and crank-pin, drip-oiler for eccentric and special oilers for main bearings, valve cross-head, and numerous other necessary articles and attachments.

The main bearing has received special attention in the construction of this engine. The Babbitt & Harris patent automatic spring packing is used with the piston, and also the self-adjusting loose packing rings, being held to a bearing in the bore of the cylinder by German-silver springs, thus forming the best piston-joint known.

The shaft governor is illustrated in Fig. 2, and it is intended to convey an idea of the general principle by which the plain throttling engine is reduced to an automatic cut-off engine; that is, the appliance that limits the supply of steam to the engine proportional to the amount of work the engine is called upon to perform, and at the same time to control the motion of the engine to the least possible variance from a fixed or desired speed.

In the shaft governor used on the larger engines a loose or dead wheel is an important factor where fine results of close regulation are desired. This principle of inertia is made effective in the governor offered with the self-contained engine by the method of hanging weights from the centre of the wheel. Attention is to be called to the simplicity of design of this governor.

Another important feature of this engine is the balanced slide-valve. Fig. 3 represents a perspective view of the valve and hood complete. Fig. 4 is a section of the valve and hood on the line *A B* of Fig. 3. In Fig. 5 the hood is detached, showing the valve and seat and the interior construction.

There is a flat slide-valve protected from steam-pressure by the hood. The exposed ends, being of equal area, balance each other. The pressure under the valve through the ports is counterbalanced by recesses of equal area with the ports under the hood and over the valve. The only friction is the weight of a very light valve. To provide for water or excessive pressure in the cylinder, the hood is set loose on the seat, and readily yields. The springs return the hood to place and the studs guide it to its correct seat. The port-action of the valve is that of any slide-valve, and the recesses over the valve quicken the opening and closing of the ports.

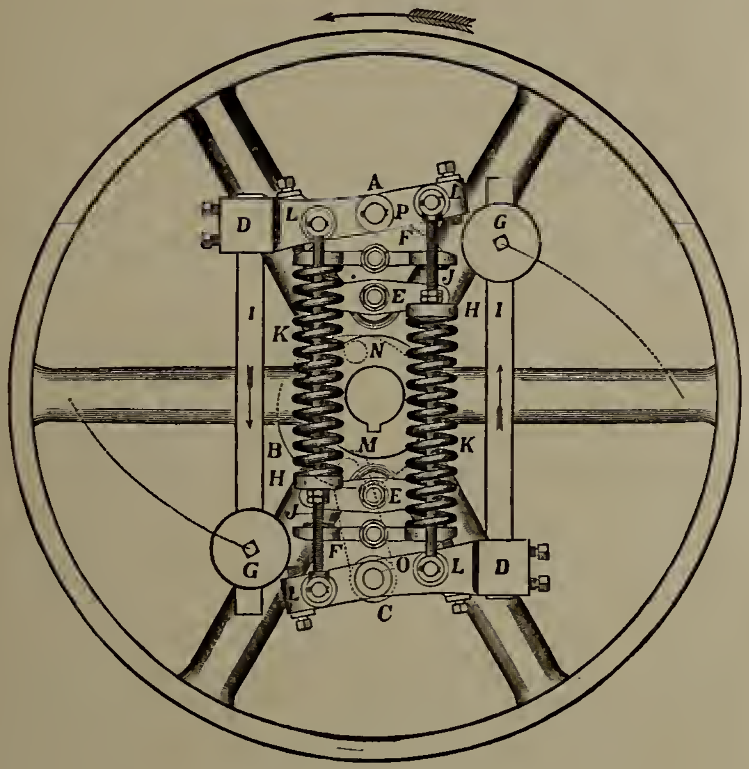


FIG. 2.

These engines are built on iron jigs with steel buttons. Thus the parts of one engine are interchangeable with those of another without any necessary filing or fitting. It is claimed for this engine, with its special governor and valve, that there is economy in fuel and price, and a perfect regulation.

Edward P. Hampson & Co., 36 Cortlandt street, New York city, are the Eastern agents for these engines.

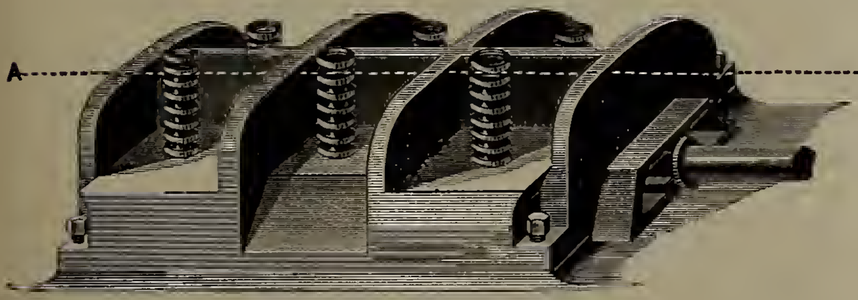


FIG. 3.

McGILL UNIVERSITY, MONTREAL.

We have received an invitation from the chancellor, governors, principal and fellows of McGill University, Montreal, Can., to attend a conversazione on the occasion of the opening exercises on February 24, 1893, of the Macdonald and Workman engineering buildings of that institution. The opening ceremonies will be performed by Lord Stanley, governor-general of Canada.

ASKS ANNULMENT OF A TELEPHONE PATENT.

A Washington despatch states that Attorney-General Miller on February 9 filed a complaint in the United States Circuit Court for the District of Massachusetts, at Boston, against the American Bell Telephone Company and Emile Berliner. It asks for an annulling of patent No. 463,569, for a combined telegraph and telephone, applied for by Berliner on June 4, 1877, and issued Nov. 17, 1891, to the American Bell Telephone Company as Berliner's assignee. The grounds upon which the application for annulling the patent is made are that the claims set up in the Berliner patent, granted in 1891, are covered by previous patents issued to the Bell Company, beginning with the original Bell patent, No. 174,465; that the possession of said patent No. 463,569, if valid, will continue to the Bell Company, without substantial diminution during the full term thereof, the same close monopoly of the art of telephony in the United States which it has enjoyed under patent No. 174,465; and that it is against the spirit and intent of the patent laws, and against justice and equity, that the monopoly of one and the same invention shall be prolonged in one and the same person by the grant, first of a patent or patents for the invention in practical and applied form, and afterward of a patent covering nakedly and broadly the fundamental principle of the same invention.

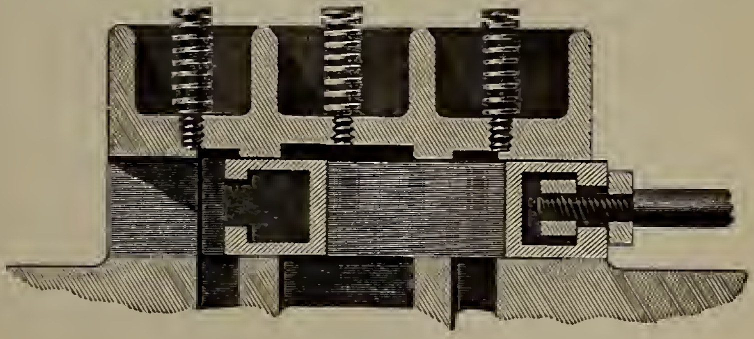


FIG. 4.

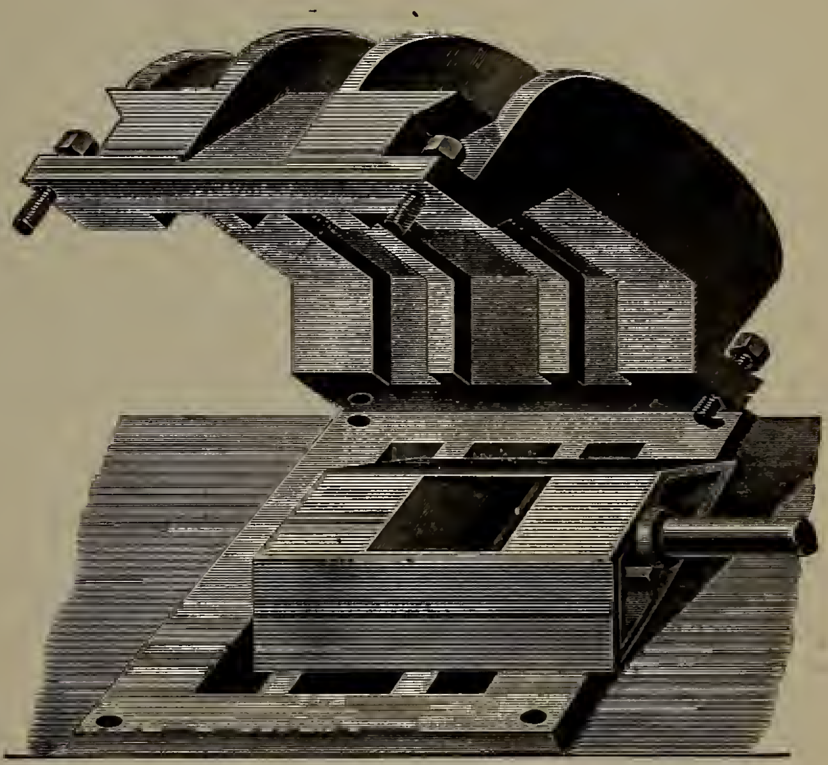


FIG. 5.

An electric wire pole broke and crashed into the side of a house in St. Louis on February 1, demolishing the furniture and other domestic fixings. This incident has given a fresh impetus to the clamor against overhead wires in that city.

THE GRAHAM SHORT TRUCK.

The rail-joint problem is one of the most difficult that has been presented to street-railroad engineers for solution since the introduction of electric motors for the propulsion of street cars. As car trucks are usually constructed they are rigid on the axle-boxes, and half the weight of the motor and the whole weight of the truck goes down on the rail like a sledge-hammer when an obstruction is met. In the case of rail-joints, every time they receive this heavy blow the tendency is to depress them and otherwise injure the rail.

This condition of things has to a great extent been overlooked in street-railway practice, but now the injurious results have become recognized, and efforts have been made to overcome the evil.

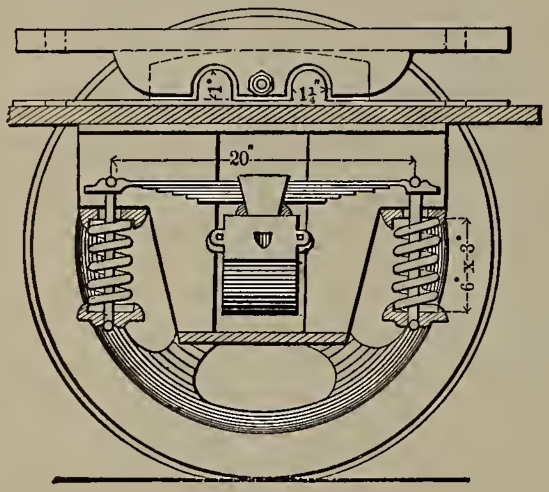


FIG. 1.

The Graham short truck has been designed with this object in view, and from the description and illustrations which follow, any practical street-railroad man may judge for himself as to how far the truck fulfils the important requirements claimed for it.

Fig. 1 shows the axle-box and method of suspending the weight thereon. An elliptical spring is put on top of the axle-box so as to allow of the wheel working up and down when it passes an elevation or a depression on the track. The spiral springs carry the empty car and varying load to 50 passengers, then the straight springs come into action; they then assume the load from 50 to 80 passengers, or the maximum capacity of car and platform. The springs in this way adjust themselves to the load.

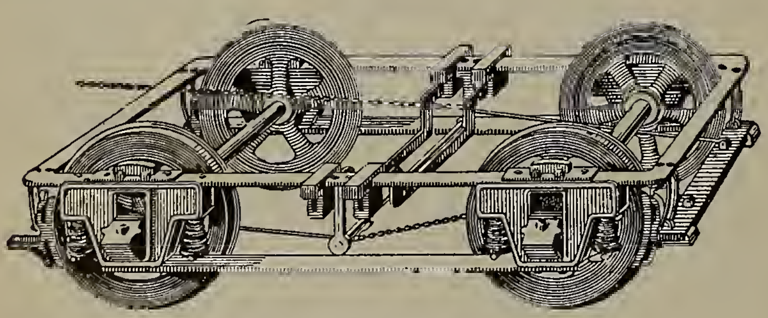


FIG. 2.

In Fig. 2 is seen a view of the Graham short truck, No. 32, complete. Over each axle-box are the body castings shown in Figs. 3 and 4, Fig. 3 representing the section that is attached to the frame of the car-body, and Fig. 4 the part placed on the truck-frame.

The Consolidated Railway Supply Co., of 258 Washington street, Boston, Mass., manufacturers of this truck, make many important claims for it. Some of these are: simplicity of design; large, simple and durable axle-box; easiest riding; no oscillation of any kind; lightest made; easiest and cheapest to repair; noiseless; all parts standard and interchangeable.

The brake-gear is strong, quick-acting, positive and with few parts, and the truck can be used on a 16, 18 or 20 foot car-body. The springs are straight leaf and cushioned on spirals, and the car-body is only 28 inches from the ground. One great advantage this truck possesses is the facility with which it can be removed from one car-body to another. To do this only 4 bolts have to be removed. The wheel-base is of three sizes, viz.: 6 feet, 6 feet 6 inches, and 7 feet.

Since the truck-frame and car-body are entirely spring-suspended the life of switches and rail-joints are increased, and the severe hammering on the rails is to a very great extent avoided.

All of these points are worthy of the most careful consideration of street-car managers.

PHILADELPHIA'S FIRST ELECTRIC RAILWAY.

The completion of the Philadelphia Traction Company's Catharine and Bainbridge Street Electric Railway in Philadelphia, Pa., has put in operation one of the finest and most improved roads in the country. The construction work was in charge of the Field Engineering Company of New York City.

The road is built with the overhead trolley-wire, though the feeders had to be placed underground by reason of a city ordinance.

The cars are of the J. G. Brill Company's make. The length over platform is 24 feet, and the width at belt-rail is 7 feet 6 inches. Inside they are handsomely furnished in ash, with decorated veneered ceilings and double thick French glass in sash. The seats and back are upholstered with cherry plush. The cars have all of Brill's improvements to date, including the radiating draw-bars, ratchet brake-handles, patented gravity gates, pedal alarm gongs, and are mounted on Brill's No. 21 truck, which has a solid axle-box frame—said to be the only truck in the market which has this frame. The Nuttall trolley-poles are used on these cars.

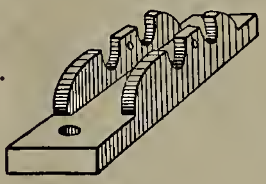


FIG. 3.

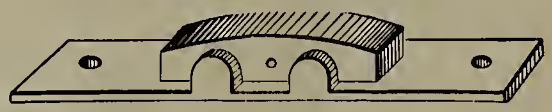


FIG. 4.

Each car is equipped with two 20 H. P. Westinghouse single-reduction iron-clad motors, and is provided with the latest safety and controlling devices.

The poles supporting the overhead wires are of wrought-iron 4, 5, 6 inch sections, extra heavy pipe 28 feet long, and are set in 5½ feet of concrete, made of the best Portland cement, slag and sand. The span-wire is of the same material, of No. 3 B. & S. gauge, and is fastened to the poles by the Brooklyn insulated turnbuckle. The trolley-line hangers are the round-top bell insulators of moulded mica. All feeder-spans are provided with extra insulators. This gives triple insulation and reduces the leakage to a minimum. The trolley-wire is No. 0 B. & S. gauge Roebling's hard-drawn copper wire, and is secured to the insulator by soldered clips. The guard-wires are two in number, of No. 6 B. & S. gauge silicon bronze wire placed 3 feet apart and 18 inches above the trolley-wire. The trolley-wire is anchored every 1,200 feet by diamond guys and on each side of every curve.

All feeders had to be placed underground, and manholes are placed in front of each feeder-pole and at suitable distances, to enable the efficient handling of the wires. A cast-iron cover and water-tight plate are provided for each manhole, and in places where it is possible connection has been made with a sewer from the bottom through a bell trap, thus taking off any water that may accumulate there.

The conduit system adopted consists of a wrought-iron shell one-sixteenth of an inch thick, thoroughly riveted and lined with three-sixteenths of an inch of cement concrete, the interior surface being smoothly finished and polished. The pipes are 3 inches in diameter and of suitable lengths. There are eight of these pipes, and they are laid in concrete two feet below the line of the street. The National Conduit Company of New York City supplied all the conduits.

The feeders are the Standard Underground Cable Company's 0000 lead-covered cables. Two cables are intended for each conduit and are run into junction boxes, whereby connection is made in the manhole with the overhead wires.

The H. W. Johns Manufacturing Co.'s line-insulating material has been used on the work throughout.

The rail used in the construction of the track is Wharton's 90-pound side-bearing steel rail, $9\frac{1}{2}$ inches high, resting upon a tie-plate and spiked directly to the tie. Tie-rods are used. The rails are bonded at every point with a No. 0 iron wire and channel-pin, and are cross-bonded every 90 feet.

BRILL CAR.—PHILADELPHIA TRACTION CO.

The power-house of this road, situated at the corner of Sutherland avenue and Kansas street, is a brick building, approximately 170 feet long by 73 feet deep. The building is as artistic as its utility would permit. Provision has been made in the engine-room for a travelling-crane, if one should be desired at some future time.

The smoke-stack, made by the Connery Boiler Company of Philadelphia, is 135 feet high, built of sheet-iron, with a brick base.

The steam-plant consists of six horizontal return tubular steel boilers and three horizontal single-cylinder engines. The boilers are designed for a working pressure of 100 pounds, and are 72 inches in diameter and 20 feet long, having domes. The longitudinal seams are triple riveted, and the joints double butt strapped. The main flue of the chimney is at the rear of the boilers, and the setting is so arranged that the gases return over the top of the boilers before entering the main flue. The water is supplied by two duplex feed-pumps, 8 x 6 x 10 inches, and two No. 10 Monitor injectors. The engines are of the Wetherill-Corliss type, 250 H. P. each, with the latest improvements. At present the engines will run non-condensing, but all provisions have been made to enable the plant to run condensing whenever desired.

An important feature of the steam piping is that any boiler can be connected with any engine, thereby obtaining the least liability of a shut-down due to repairs. Pipes that run from the boilers are carried to a main under the engine-room floor, and from there to the engines. The engines and boilers were furnished by Robert Wetherill & Co., of Chester, Pa., and the valves by the Chapman Valve Manufacturing Co.

There are three generators of the four-pole Westinghouse type, running 525 revolutions per minute and of 186 kilowatts capacity. The frame is of cast-iron, in two sections, and concentric with the armature-shaft. The field-magnets are wound with four series windings in parallel. The shunt fields are all in series. The commutator has 95 sections, one turn of wire to each section, with a diameter of $17\frac{1}{8}$ inches. The bars are made of Eureka copper, which is specially tempered. The armature-shaft is $4\frac{1}{2}$ inches in diameter. The generators are belted to the engine by a 32-inch Underwood cotton leather belt.

The dynamos are controlled from a vertical switchboard, the frame being built of angle iron, and all switches, circuit-breakers, ampère-meters, lightning-arresters (mounted on white marble bases) are secured directly to the switchboard frame. The butt-bars run along back of the switchboard, and from these the feeders are run to a vault, where connection is made with the underground system. The material used is incombustible, thus reducing the danger of fire in this section.

"THE TELEPHONE, AND HOW WE TALK FROM NEW YORK TO CHICAGO."

This was the title of a lecture given before the New York Electrical Society at Columbia College on Wednesday evening, February 8. The lecture was divided into two parts—the first by Mr. J. J. Carty, electrician of the Metropolitan Telegraph and Telephone Co., New York city, and the second by Mr. F. A. Pickernell, engineer and electrician of the American Telegraph and Telephone Co., better known as the "Long-Distance Telephone."

There was a very large attendance, including many ladies, and the lecture was one of the most interesting of this season's series.

Mr. Carty opened his portion of the lecture by a description of the nature of sound and the mechanism of speech; its propagation and reception by the ear, and the physiology of the ear. By the aid of lantern slides these ordinarily difficult subjects were made quite clear to all present, and when Mr. Carty reached the portion of his remarks touching the construction and operation of the telephone his audience was in a proper frame of mind to easily understand the underlying principles and their practical application.

Mr. Carty traced the telephone of to-day from the speaking-tube and the string, or lovers' telephone, and described in a very broad manner the other apparatus which combine in the make-up of the complete telephone.

Mr. Pickernell described the long-distance lines, and reviewed the enterprise from its beginning to the present day, the climax of its development being represented by the New York-Chicago telephone line.

Several lantern slides showed views of the interior of telephone exchanges, distributing poles, pole lines *en route*, etc., on the New York-Chicago line.

Through the courtesy of the Long Distance Telephone Co., connection was made with the Chicago line and several receivers were placed at the disposal of the members, who listened to speech and music transmitted from Chicago. The line worked remarkably well and everything came through very clear.

WATTMETER FOR HOT CLIMATES.

The use of the ordinary type of Thomson recording wattmeter under abnormal climatic or other conditions has been restricted owing to the various difficulties with which it had to contend. The General Electric Company has therefore designed and manufactured a different type of meter which, while possessing all the advantages of the well-known meter as used all around us, has special features which enable it successfully to meet the altered conditions. It is especially designed for service in hot climates, where atmospheric influences are uncongenial and mephitic gases, damp vapors and minute insects prove detrimental to the ordinary type of recording meter. A glance at the cut will show wherein it differs from the ordinary type. It is a skeleton meter. On the upper side of the lower plate is a groove running completely around it, and into this the cover sets. The groove is filled, after the cover is in place, with heavy oil, gum or cement, preferably a heavy oil. The hole in the base through which the sealing plug of the meter passes is hermetically sealed by means of a soft rubber washer under the wing-nut, while the leading-in and leading-out holes are closed around the wires by a rubber diaphragm, through which the wires are punched on being entered.

These meters are especially useful in such places as chemical factories, dye-houses and elsewhere, and, as they fill a want, should find a large demand.

They are made in all standard sizes up to 150 ampères, and all voltages up to 100 volts, for two wire system only, and are known as type "T."

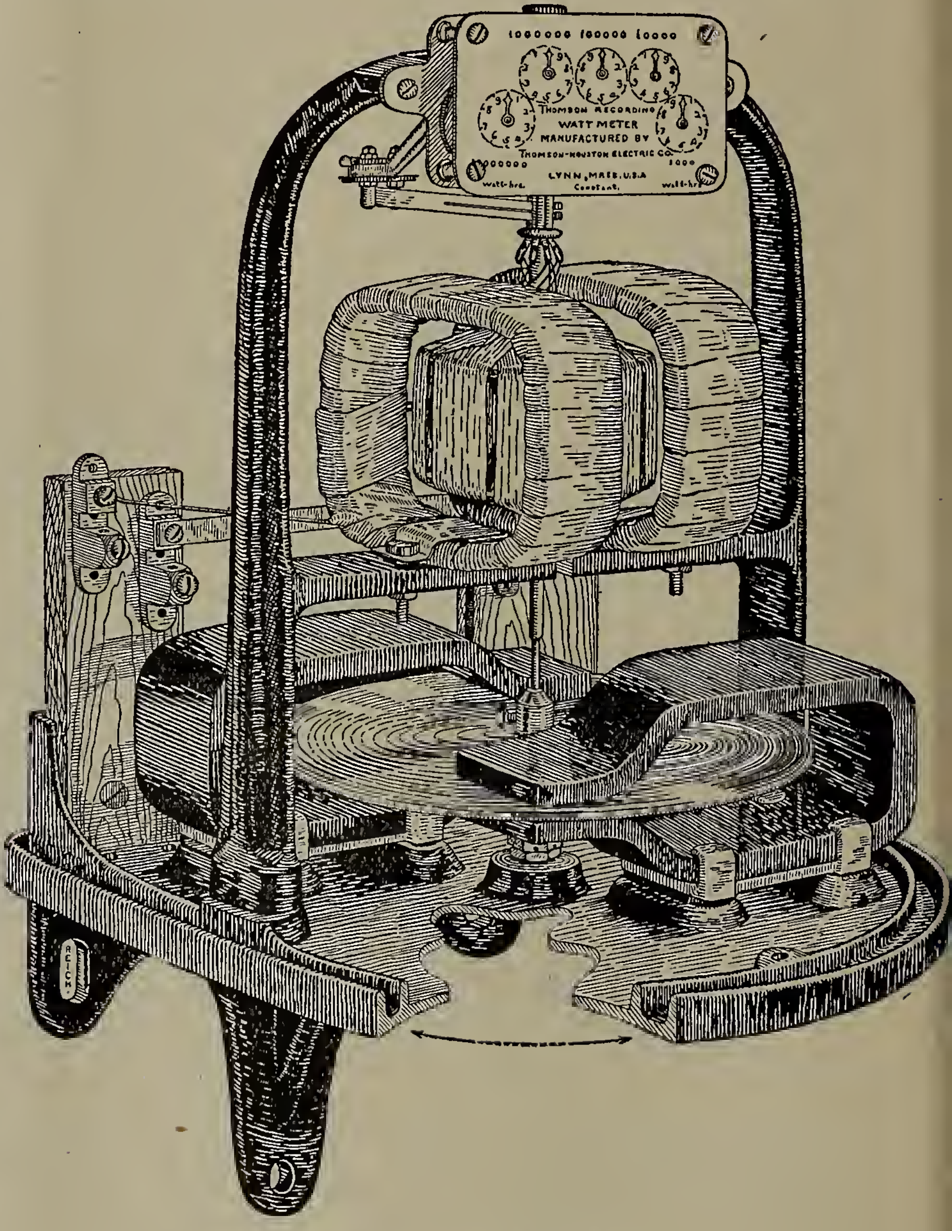
THE name of the Akron Electric Light and Power Company, Akron, O., has been changed to the Akron General Electric Company.

THE new electric-light plant of the Titusville Electric Light Co., at Titusville, Pa., is a very complete one and attracts considerable attention. The engines are two 150 H. P. Ball tandem compounds, furnished by the Ball Engine Co., Erie, Pa.

THE DEFLECTION AND CONTROL OF GALVANOMETERS.*

BY E. TREMLETT CARTER.

The observation of the conditions of electrical stress which produce and limit the amount of deflection in any measuring instrument is an interesting and profitable one; and it is proposed in this paper to make a short study of the sources of the energy which produces the deflection in magnetic and thermal galvanometers, whether for measuring current or voltage. It is well known that two forces are concerned in the deflection—one, the electrical or magnetic force of the quantity measured, which is caused by the coil or heated wire; and the other the controlling force, which is variously produced by magnetic, gravitational, or other elastic forces. In most instruments the controlling force has to bring the pointer back to zero when the current ceases; but there is an exception to this rule in the Cardew voltmeter type, in which the deflection is *produced* by the controlling spring and *cancelled* by the contracting wire. In any case, however, there is some transfer of energy when the deflection is being produced or cancelled; and the source and destination of this energy form a very interesting inquiry. In an ideal instrument the whole of the energy which produces the deflection would be given back when the pointer returned to zero. But, in practice, owing to the imperfect elasticity of the deflection—through friction—the energy is only partially restored. The frictional resistances are opposed both at the forward and at the return motion of the pointer, causing a waste of energy on each occasion.



TYPE "T" WATTMETER.

The energy which is temporarily expended when the deflection is being made must not be confused with that constant expenditure which takes place the whole time the instrument is in circuit. The two have no necessary relationship. The mere $C^2 R$ energy does nothing useful—neither in a magnetic nor in a thermal instrument. It may at first sight appear that the $C^2 R$ function does some useful work in a thermal galvanometer; that in fact it supplies the heat by means of which the deflection is produced. But this supposition would be erroneous. The energy which does the work of the deflection is actually put into the instrument when it is manufactured, namely, at the moment the tension of the controlling-spring is brought to the required amount. The *resilience* of the spring is a continual store of energy, which is partially and temporarily drawn upon whenever a deflection takes place. This is restored to the spring in full amount when the heated wire cools and contracts. If we trace the passage of this energy from the instant it leaves the spring to the instant it gets back again we shall follow a thermo-dynamic study of peculiar beauty.

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* *Electrician*, London.

It is well known that all substances which expand on the addition of heat have their specific heats apparently raised by being subjected to increased external pressure, and lowered by being placed under tensile stress. The reason is that in the former case the expanding body does external work against the compressive force, while in the latter case the stress expends some energy in heating the expanding body. On this account, if a thin wire is heated by the passage of an electric current it will take less energy from the current, and will take less time in rising to its limiting temperature if it is under tension than if it is slack. Some of the stored heat of the wire is due to the current, but some of it is due to the expenditure of resilient energy under the relaxation of elastic stress of the spring which holds the wire tight. When the current ceases and the deflection is returning to zero the conditions are reversed. The contracting wire expends heat on the tension spring, restoring its lost resilient energy, and, in the ideal instrument, the amount of heat which will thus be converted into work will equal the energy originally taken from the spring. Thus it will be seen that the true $C^2 R$ function has nothing to do with the source of energy which causes the deflection. If the stress-strain diagram of the hot wire of such an ideal instrument be plotted, the curves representing a complete cycle will enclose no area; but in an ordinary instrument this would not be the case. In such the curve of deflection would lie nearer to the axis of stress than the curve of restoration to zero; and the area enclosed would represent loss of energy on account of friction pretty much as the area of the Ewing-cycle represents hysteresis losses.

In an electro-magnetic galvanometer the source of energy of the deflection is the electric circuit, but not through the medium of the dissipation function. The medium of exchange of energy is an electromotive force which is set up in the circuit when the needle moves. In a forward deflection there is a back electromotive force, which takes some energy from the circuit; while in the return of the deflection to zero there is a helping or forward electromotive force which restores this energy to the circuit from whence it had been taken. During the deflection this energy exists potentially in the controlling mechanism. Thus, if there is a bar-magnet control, the energy is stored magnetically in the ether; if there is a spring control, the energy exists as resilience of the spring; while if there is gravity control, the energy exists as a stress—*where?* Would that we could say where! *Is* it the ether?

THE Norwalk Electric Construction Company, Norwalk, O., has been granted a franchise for the construction of an electric-light plant.

MUNICIPAL ELECTRIC STREET LIGHTING.

A concise article on the question of municipal or private supply of electric lighting for the streets of our American cities appears in the February number of the *Review of Reviews*, written by Robert J. Finley. The following is a condensation of his article:

Although it has been less than six years since the field of electric lighting was first entered by the municipality more than one hundred and twenty-five cities in the United States now own and operate plants. The movement has extended across the country, though so far it has been confined chiefly to the smaller cities. Nevertheless the larger cities are beginning to discover that their size is not necessarily a bar to their entrance upon the same course. Chicago has been operating successfully seven hundred and fifty arc-lights, and the sphere of operation is rapidly extending. The mayors of New York, Boston, Philadelphia, Baltimore, Atlanta and other large cities have discussed the subject in their messages.

The number of cities owning electric-light works would be greater than at present were it not that in many States municipal corporations are prohibited from incurring debt beyond a small per cent. of the taxable basis of the community. Inability to issue bonds prevented Milwaukee in 1889 from establishing a city plant. Almost invariably when cities were restricted in their debt-creating power and had applied to the legislature for the privilege to borrow money with which to construct works, representatives of private corporations have been on hand to oppose and, if possible, to defeat the bills.

The average cost of each arc-light owned and directly operated by twenty-five cities is $53.04 a year. In the statistics and information obtained from the official statements of the various municipalities, it appears that only three or four of the cities have included interest on investment.

Obviously account should be taken of both interest and depreciation of property, which items, computed at twelve per cent. of the total value, would add $33.60 to the first cost, making the average final cost $86.64 per arc-light per year. (These figures are deductions from statistical tables accompanying the original article.)

There is one important factor that has not been considered in this cost, namely the profits which many of the cities receive from light supplied to private and commercial houses. Eighty dollars per light per year will be found to be much nearer the real cost of municipal electric lighting in the United States if the receipts from commercial lamps are deducted.

The average price charged by private corporations for each arc-light is shown to be $106.01, or nearly $20 a lamp more than it costs the cities to supply their own light. In the comparing of these cities, those supplying their own light and those not doing so, such cities have been selected in which their electric lighting requirements are as near alike as possible.

Many of the municipal electric-lighting plants are operated in connection with municipal water-works, and this is one of the chief reasons why cities furnish themselves with light more cheaply than private companies perform this service. By uniting these two services the running expenses of the plant are made comparatively light.

Then, too, the municipal plant is not operated for profit, while the prices of the private companies are regulated to yield a return on the investment. Often the item of profits represents the only difference between the cost of municipal and of private electric lighting.

But even if companies could do the lighting as cheaply as municipalities, it is a doubtful question whether or not they would. Electric lighting is one of the services the rates of which are practically precluded from the regulating influence of competition. On account of the limited number of companies that can operate in the same territory at one time, free and natural competition is made impossible.

The facts and statistics presented do not introduce any new principle for municipal action. "They only emphasize," concludes the article, "what has already been demonstrated a hundred times by experiment—that pursuits which from their very nature are natural monopolies cannot be so economically administered by private corporations as by the government."

THE ST. LOUIS CONVENTION.

The following is a copy of the circular letter issued by Mr. C. O. Baker, Jr., master of transportation of the National Electric Light Association, regarding transportation from New York to St. Louis on account of the convention in the latter city on February 28, March 1 and 2 next :

"An excursion rate of a fare and a third has been granted to St. Louis and return for delegates attending the convention of this association by all the passenger associations except the Western; negotiations are now pending with them, and in all probability they will grant this concession.

"Arrangements have been perfected for a special train to carry the Eastern delegation, which will be vestibuled and electrically lighted, and composed of dining, buffet, observation and sleeping cars, and will leave New York, *via* Pennsylvania Railroad, from stations foot of Cortlandt and Desbrosses streets, Sunday, February 26, at 12 o'clock noon; Philadelphia, 2.25 P.M.; Harrisburg, 4.25 P.M.; Pittsburg, 10.40 P.M. (Central time); Columbus, 4.35 A.M.; Indianapolis, 10.30 A.M.; arriving at St. Louis at 5.30 P.M., Monday, February 27. The rate for berths is $6 each; drawing-rooms, $22 each.

"For the convenience of passengers taking this train from New York arrangements have been made so that if they will remit to the undersigned the amount of railroad fare ($24.25) with the sleeping-car fare ($6) a receipt will be mailed them that will be honored by the railroad company for checking baggage, ferry passage and passage through the gate at Jersey City, and exchangeable on the train for regular railroad ticket and certificate.

"The Boston passenger committee have declined to sell tickets at a reduced rate from Boston *via* New York; therefore the Eastern delegates who desire to take the Electrical Special will be compelled to come to New York, purchase tickets and secure certificates from New York to St. Louis and return.

"The following-named gentlemen have charge of transportation matters in their various territories: Morris W. Mead, Pittsburg, Pa.; Fred W. Royce, Washington, D. C.; John Carroll, Montreal, Canada; A. C. Shaw, Boston, Mass.; M. J. Hart, New Orleans, La.; John W. Flintham, Denver, Col.; J. Scribner, 173 Adams street, Chicago, Ill.; Louis Nahm, St. Louis, Mo.; H. A. Cleverly, Philadelphia, Pa.

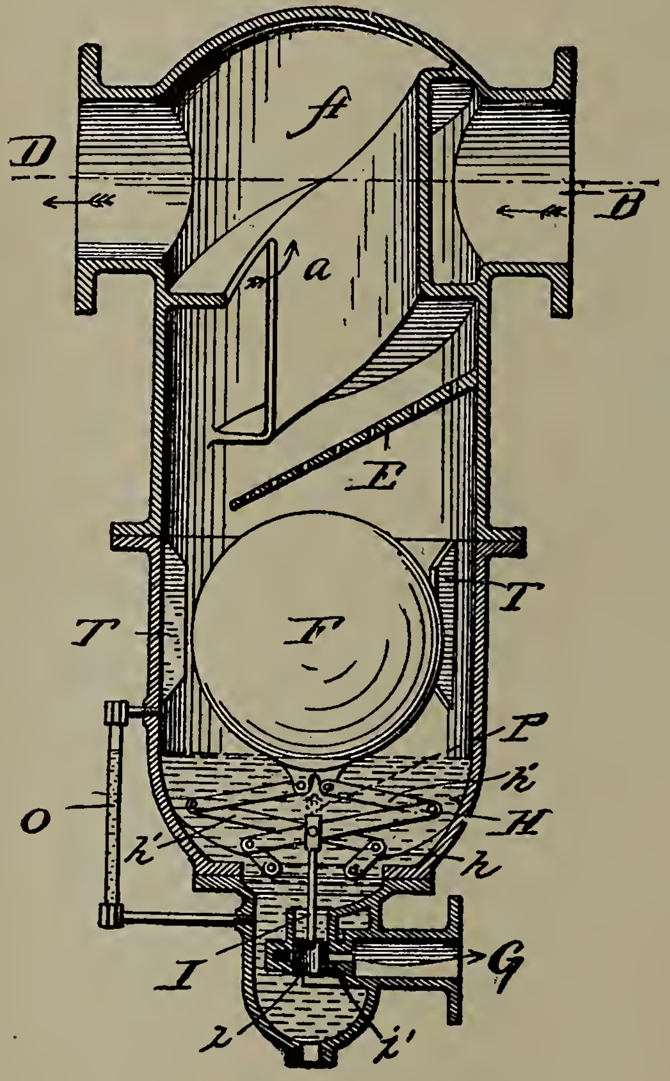
"To secure the benefit of the reduced fare returning it will be necessary for those who do not go by the Electrical Special to be sure and state to the ticket-agent at the time they purchase the going ticket that they purpose attending the meeting of the association at St. Louis, and procure from him a certificate which will entitle them, when properly vised and countersigned, to return for one-third the regular fare. No reduction can be obtained without this certificate. Immediately upon arrival in St. Louis these certificates should be left at the secretary's office, addressed to the undersigned, who will see that they receive the proper attention and are returned to the owners.

"C. O. Baker, Jr.,
"Master of Transportation.
"136 Liberty Street, New York."

MANNING'S STEAM SEPARATOR.

The internal construction of Manning's double centrifugal steam separator and grease extractor is shown in the accompanying illustration, and with the description that follows the operation of the apparatus will be easily understood.

The steam enters the separator from the boilers through the inlet pipe B and splits into two currents of equal area, passing through helicoidal channels and emerging from the lower orifices. Owing to this circumferential divergence of the steam the drops or heavier parts seek the outer edge of the currents, and the collision with the opposite current, together with the downward motion acquired in passing through the channels, cause all water to be precipitated to the bottom of the reservoir, while the dry steam makes another centrifugal turn and passes to the engines. The accumulating water or oil in either the steam or exhaust connection is discharged by a suitable trap.



STEAM SEPARATOR.

This is claimed to be the best separator made, because, owing to its construction, water once thrown out cannot again come in contact with the current of steam ; it is of small weight and requires small space ; the trap-valve, which is absolutely balanced, is automatic, and at the same time under the control of the engineer by a special lever attachment ; certainty of action of the trap and valve, and because it is adaptable to either the steam or exhaust side of cylinders.

The separator shown in the illustration is of the design adopted on the U. S. S. cruiser "Concord," which is a practical endorsement of the merits of the apparatus, and its efficiency has been confirmed.

This separator and grease extractor is handled by Mr. E. J. Wood, dealer in steam specialties, No. 243 Broadway, New York city.

MODEL MACHINE-SHOP.

Modern machine-shop construction has taken rapid strides in the past few years. The low price of iron and the largely increased use of travelling-cranes necessitated an entirely different construction from the old-fashioned machine-shop and jib-cranes for moving materials. The accompanying illustration is made from a photograph, and shows the interior of the new machine-shop of the Lake Erie Engineering Co., at Buffalo, N. Y., which is probably one of the finest and best equipped machine-shops in the world. The building was erected by the Berlin Iron Bridge Co., of East Berlin, Conn., and is 50′ in width from centre to centre of crane girders, with a wing on each side 28′ in width, of two stories high. A power-crane controls the entire floor-surface of the central portion of the building, which is made high so as to admit of being used as an erecting-shop. The wings are controlled by jib-cranes and are designed for lighter work in the second floor. The building is absolutely fireproof, as the walls are of brick, the roof of iron, slate and glass. The only wood-work in the construction of the building is the floors. Particular attention is called to the lighting of the interior of this shop, as so many machine-shops are lacking in this essential feature. Along the central ridge the entire length of the building is a skylight 12′ wide on each side of the centre which gives a well-diffused light through the centre of the building and also on the second floor of the galleries. Light is also admitted by side windows, these windows being placed above the crane girders far enough so that the latter do not interfere with the free distribution of light. Skylights are also provided in the roof of the wings on each side, being placed in alternate panels. These, taken in connection with the windows in the side-walls, furnish ample and well-diffused light through every portion of the building, making it one of the best-lighted structures to be found anywhere.

LAKE ERIE ENGINEERING CO.'S MACHINE-SHOP.

TELEGRAPH DEPARTMENT.

A cablegram from Paris announces that the French ministry approves of the proposition to lay a submarine cable from New Caledonia to Australia.

Mr. William H. Eckert, formerly general manager of the Metropolitan Telegraph and Telephone Co., New York city, brought an action for the recovery of 270 shares of the stock of that company, and on February 6 Judge Andrews of the Supreme Court dismissed the case.

The American District Telegraph Company, of New York city, has increased the rates for its messenger service by 33⅓ per cent. and more, according to the service and section of the city. The company claims that the old prices were unfair, and now that it had practically no competition it was arranging matters on a fair basis.

The coroner's jury has found telegraph operator George June responsible for the collision on January 19 last between two Pennsylvania Railroad trains on the Hackensack Meadows. June was the operator in the signal-tower near the scene of the accident, and neglected to set the signal, which failure resulted in a collision, the death of one passenger and the injury of many others. June's bail has been fixed at $10,000.

THE PREMIER BATTERY.

A battery suitable for the running of electric fan motors, sewing machine motors, turn tables for electro-plating work, telegraph instruments, or for experimental work, which can be relied upon and yet be obtained at a moderate cost, has been the need of many. The Premier battery seems in every way to accomplish this object. This is a new form of the blue-stone battery, a description of which was given in a former issue. As a motor battery it will operate from 4 to 12 inch fans. The motors need not be specially wound, and resistance coils or short-circuiting devices are not required to keep the battery in working order when the motors are not in use.

PREMIER BATTERY.

There are two types of this battery: Type A is 5 x 7 inches, and type B is 6 x 8 inches. They have a voltage of about 1.079, and ½ to 2 ampères.

The cell contains a surface of nearly 100 square inches of oxidized carbon, and 60 square inches of zinc, which is specially made of zinc and mercury only. Their use affords an increase of electro-motive force and a decrease of internal resistance.

These cells have been known to run a No. 3 Premier motor for a period of 200 hours, night and day, and for 400 hours at 10 hours a day. The zincs will last over 1,500 hours and are never taken out of the solution.

Mr. M. R. Rodrigues, 17–19 Whipple street, Brooklyn, New York, is the sole manufacturer of these batteries.

PHILADELPHIA NOTES.

THE PHILADELPHIA MACHINERY AND SUPPLY CO., No. 19 North Seventh street, is the agent for the Dick &

(Continued on page 105.)

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Attleboro, Mass.—Some of the prominent citizens of this place are agitating the question of introducing electric lights here.

Delevan, N. Y.—The Delevan Electric Light Company has asked for permission of the village authorities to construct a line. The pay to the company for the light will be raised by subscription.

Gloversville, N. Y.—Extensive additions will be made to its plant by the Gloversville Electric Light Company, Gloversville, N. Y. A building 50 x 35 feet is to be constructed for a new engine and boiler, to be held in reserve in case of an accident.

Norwood, Mass.—The residents of this place are discussing the question of having an electric plant installed.

Painesville, O.— The subject of incandescent electric lighting in this town is being discussed.

Richmond, Ind.—The subject of installing a new electric-light plant here is being seriously agitated.

Royersford, Pa.—The Royersford council has granted a franchise to light the town by electricity to the Schuylkill Valley Illuminating Company.

Wellsville, N. Y.—The Wellsville Electric Light, Heat and Power Company has been formed for the purpose of furnishing this place with electric lights.

NEW CORPORATIONS.

Chicago, Ill.—The Independent Telegraph Company. Capital, $25,000. Incorporators, O. M. Stone, J. W. Turner and Geo. W. Stone.

Concord, N. H.—Whitefield Electric Light Company. Capital, $6,500.

A petition has been presented for the incorporation of the Bartlett Electric Light and Power Company.

Delevan, N. Y.—Delevan Electric Light Company has been organized to supply electric light for this town.

Franklin, Me.—Daniel M. Bonney and others have petitioned for the incorporation of the Franklin Light and Power Company.

Freeport, Cal.—The Freeport Telegraph and Telephone Company. Capital, $40,000. Directors: D. T. Lufkins, H. T. Lufkins, F. Kunsting, Geo. Lawlor, J. G. Hite and H. T. Huggins.

Guilford, Conn.—A petition has been presented for the incorporation of the Guilford Electric Light Company by Mr. Davis, of this city.

Newtown, Conn.—A petition has been made for the incorporation of the Newtown Electric Light and Power Company.

San Francisco, Cal.—San Francisco Electric Company. Incorporators: J. G. Gardner, C. S. Wright, J. R. Gates, J. F. Meyers and H. E. Monroe.

The Electric Damper and Pressure Regulator Company. Capital, $100,000. Directors· Joseph St. Mary, W. C. Storr, H. W. Chase, J. P. Moore and John Collie.

Wellsville, N. Y.— Wellsville Electric Light, Heat and Power Company. Capital $20,000. Incorporators: J. George Kaelber, Maurice O'Connor, Jr., C. D. Crandall, John McPherson and Charles Kaelber.

Buffalo, N. Y.—The Buffalo Electrical Construction Company, Mr. H. V. Ford, Supt., has been incorporated. It has opened an office in the new Laird building, Niagara street, Buffalo. Mr. Ford was formerly connected with the Edison Company and is a thorough and practical electrician.

Cloquet, Minn.—The Cloquet Electric Light and Power Company. Capital stock, $50,000. Incorporators: W. P. Allen, A. M. Sheldon, A. Peterson, J. E. Lynde and F. B. Poole.

Colorado Springs, Col. —Interstate Electric Light and Power Company. Capital, $100,000.

Duluth, Minn. — The Commercial Light and Power Company has been incorporated with a capital of $500,000 to furnish electricity for light and power purposes. Incorporators : Morgan Brooks, of St. Paul ; Franklin Paine and G. A. Leland, Duluth.

Hartford, Conn.—A petition has been introduced in the Connecticut House for the incorporation of the People's Light and Power Co.

Manchester, Conn.—N. T. Pulsifer and others are the incorporators of the Manchester Light and Power Company. Mr. Wood of this place is also interested.

Niagara Falls, N. Y.—The Power City Illuminating Company was incorporated January 19 for the purpose of furnishing electric light. W. B. Rankin, New York ; P. A. Porter, Niagara Falls; H. L. Brewster, Rochester; A. Erickson Perkins, Rochester; Haywood Hawks, Rochester; and L. A. Boore, Niagara Falls, are interested. Mr. Boore is secretary of the company. Power is to be obtained from the tunnel.

Orrville, O.—The Orrville Light, Heat and Power Company. Capital, $20,000.

Pueblo, Col.—Central Colorado Electric Supply and Manufacturing Company. Capital, $100,000.

Wallingford, Conn.—The Wallingford Electric Light, Power and Tramway Company has been incorporated by Hugh L. Mallen and others. Mr. Roach, of this city, is also interested.

Westport, Conn.—The Electric Light and Power Company. Incorporators: John L. Jones and others. Mr. Hicks, of Tolland, is interested.

Belfast, Me.—The Belfast, Camden and Stockton Street Railway Company has presented a petition for incorporation.

Biddeford, Me.—The Biddeford and Saco Street Railway Company has been incorporated.

Bridgeport, Pa.—Montgomery County Passenger Railway Company. Capital, $50,000. Incorporators : Cornelius Gallagher, New York ; Edward S. Perot, Yonkers ; John W. Dettera, Norristown ; Daniel A. Holland, Daniel Stewart, Jr., James A. McGrath and Philip J. Crimen, Conshohocken.

Bristol, Pa.—The Bristol and Trenton Passenger Railway Company. Capital $48,000. Incorporators : Edward Morrell, Henry V. Massey, William V. Massey, Adolph Hermann, Torresdale ; and Frank J. Edwards, Bristol.

[*Continued from page* 103.]

Church engine, manufactured by the Phœnix Iron Works Co., Meadville, Pa.

J. ELLIOT SHAW & Co., 632 Arch street, are doing an excellant retail business, and invite manufacturers to keep them posted on good salable specialties. The Norway electric bells made by this house are celebrated.

WM. C. TRIPLER, manager of the Marcus patent auxiliary mouthpiece for telephones, made by Wm. N. Marcus, 218 No. Second street, is doing a good business in these devices. By the use of this mouthpiece whispers can be transmitted, and all loud talk is done away with. President Harrison used one during his wife's illness and speaks highly of it. D. H. Tillery, 72 William street, represents the instrument in New York city. Among the many houses and concerns in New York city using this attachment may be mentioned, Easton and Lewis, Edison Building, Manhattan Railway Co., W. H. Fletcher & Co., 345 Broadway, and the Electrical Age Publishing Co.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
FIRST FLOOR, WORLD BUILDING,
NEW YORK, February 11, 1893.

THE BARRIETT ELECTRIC COMPANY, 114 Liberty street, is exhibiting a new and improved motor.

MR. J. STANFORD BROWN, the well-known electrical engineer, is now connected with the Neftel & Marsh Company, electrical engineers, 126 Liberty street.

C. L. RADWAY is now connected with the Ball Engine Company, of Erie, Pa., in the New York office, 18 Cortlandt street, as assistant to Mr. F. R. Chinnock, sales agent for the same company.

HENRY MADDEN has connected himself with the Ansonia Brass and Copper Company, of 19–21 Cliff street. He was one of our popular electrical supply men, and his many friends will be pleased to hear from him occasionally.

MR. C. E. CHAPIN, 136 Liberty street, resident agent for out-of-town manufacturers and supply houses, has resumed attention to business, after a severe illness. He has a full line of Partridge carbon brushes for dynamos and motors, street railway motor brushes being a specialty.

THE underground conductor system of street railway of G. T. Woods will be exhibited at the World's Fair, space having been allotted for that purpose. A working model of the system, with cars, will be shown in operation, and 18 electrical devices for railway equipment will also be shown.

MR. JAMES H. MASON has again been honored by the American Institute Fair for his primary-battery exhibit. He has received the Award of Superiority. His exhibit at the recent fair attracted much attention. He lighted several incandescent lamps, ran a sewing-machine and fan-motors, and accomplished other work from one battery plant. This excellent battery is now controlled by the Mason Electric Company, 10 Vandewater street.

THE NEW YORK ELECTRICAL AND DEVELOPMENT CO., 251 William street, is fully prepared to develop models for electrical and mechanical inventions for patentees. The company's facilities are unequalled and include the latest improved machinery and expert help. It makes to order special electrical apparatus from drawings or descriptions, and is always ready to answer inquiries on such subjects. Its prices are moderate, withal.

J. H. BUNNELL & Co., 76 Cortlandt street, is a veritable permanent electrical exhibition, and it will pay any buyer to visit this old and popular house. They have all kinds of electrical goods. They are headquarters for fine test instruments ; the giant sounder ; the new main-line sounder, made to supplant the old box relay, an illustrated description of which appeared in the last issue of the ELECTRICAL AGE. The latest addition is the C. & P. dynamo, which is meeting with a ready sale.

THE UNION TELEPHONE AND ELECTRIC MANUFACTURING Co. has moved into new offices at 50 Broadway. The new quarters are very attractive. The company's business, it is reported, has increased very largely lately, and every one desiring an easy and reliable means of communication between office and house, office and factory, etc., would do well to investigate the merits of this telephone. It is said to be the only practical telephone for this class of work that is in the market, and a trial will, it is claimed, convince any one of the fact.

W. T. H.

ELECTRICAL STOCK QUOTATIONS.

The following are the latest prices for electrical securities in New York, as quoted by Geo. B. Ellery, financial editor ELECTRICAL AGE.

NAMES OF COMPANIES.	CAPITAL.	PAR.	PRICE.
American Dist. Tel., N. Y.	3,825.000	100 00	58 00
American Telegraph and Cable	14,000,000	100 00	92 75
American Visual Telegraph Co.	500,000	100 00	†75 00
Bell Telephone	17,000,000	100 00	210 00
Bell Telephone 7s	2,000,000		*113
Boston Electric Light Co	1,500,000	100 00	117 00
Brooklyn Edison Electric Light	1,500,000	100 00	113 00
Brooklyn Edison Electric Light, 5s	500 000		*100
Brooklyn Citizens' Electric Light	500,000	100 00	150 00
Brooklyn Municipal Light	500,000	10 00	17 00
Brooklyn Traction Co., N. Y.	6,000,000	100 00	100 00
Brooklyn Traction Co., Pref.	3,000,000	100 00	100 00
Brush Elec. Lt. Co. pref., Balto	600,000	100 00	80 00
Brush Elec. Lt. Co., Balto., 5s	200,000		*105
Brush Elec. Ill., N. Y.	1,000,000	100 00	30 00
Brush Elec. Ill., 6s, N. Y.	300,000	100 00	*102
Brush Elec. Co., Parent		50 00	40 00
Brush-Swan E. L. Co. of N. E.	2,000,000	100 00	20 00
Burrell Electric Signal Co., N. Y.	500,000	20 00	10 00
Chattanooga Elec. Lt. Co., Tenn., 6s	200,000		*101
Chattanooga Elec. Lt. Co., Tenn.	100,000	100 00	92 75
Chicago Gas	25,000,000	100 00	90 50
Columbia Chronophone Co., Phila	500,000	25 00	35 00
Commercial Cable Co	7,716,000	100 00	185 00
Cons. Gas Co., N. Y.	35,430,000	100 00	133 00
Cons. Subway Co., N. Y.	3,000,000	100 00	25 00
Detroit Elec. Lt. & P. Co	300,000	25 00	14 00
Detroit Elec. Lt. & P. Co. 6s	300,000		*101
Detroit Electrical Works	1,000,000	10 00	4 50
Direct U. S. Cable Co., Ltd	6,400,000	100 00	50 00
Edison Elec. Ill. 5s, N. Y.	3,250,000		126
Edison Elec. Ill., Lebanon, Pa	80,000	10 00	13 75
Edison Elec. Illuminating, N. Y.	6,500,000	100 00	127 00
Edison Electric Light Co., Phil	2,000,000	100 00	105 00
Electric Protection Co., N. Y.	100,000	100 00	75 00
Elec. Sup. & Con. Co., N. Y.	120,000	15 00	16 00
Electrical Forging Co	2,000,000	100 00	85 00
Elmira Municip. Imp. Co., 5s	1,800,000		par
Erie Telephone	4,800,000	100 00	50 00
Fort Wayne Elec. Co	4,000,000	25 00	13 00
Franklin Electric Co.. N. Y.	5,000,000	100 00	†83 00
Fremont E. L. & P. & Gas Co., O.	95,000	100 00	102 50
General Electric Co.	50,000,000	100 00	110 50
General Electric Co., 5s	7,931,000	10 00	*101
General Electric pref	4,223,700	100 00	117 00
Great West. Elec. Sup. Co. pref. 8s	350,000	10 00	10 00
Guarantee Identification Co., N. Y.	50,000	50 00	40 00
Hickory Electric Co., N. C.	12,000	100 00	112 00
Interior Conduit & Ins. Co., N. Y.	1,250,000	100 00	75 00
Int. Okonite, Limited	1,700,000	50 00	49 00
Laclede Gas Co	7,500,000	100 00	25 00
Laclede Gas pref.	2,500,000	100 00	74 50
Laclede Gas 5s.	10,000,000		86
Law Telephone	400,000	100 00	96 00
Livingston E. Lt. Co., Mont., 6s	30,000		*92
Marshalltown Elec. Co. 6s. Iowa	65,000		*98
Marysville L. & W. Co. 6s, Ohio	60.000		*98
Metropolitan Elec. Signal Co., N. Y.	1,500,000	100 00	35 00
Metropolitan T. & T., 5s	2,000,000		*103
Metropolitan Traction			148 00
Morristown L. H. &P. 5s, N. J	30,000		*102
Morristown L. H. & P.	50,000	100 00	101 00
Nat'l Elec. Manuf. and Const. Co., N. Y.	50,000	100 00	101 00
N. E. Tel. & Tel. Co	10,394,600	100 00	60 00
N. Y. and N. J. Tel. and Tel. 5s	1,500,000		*98
N. Y. and N. J. Telephone Stock	2,535.000	100 00	98 25
N. Y. Storage Battery	100,000	100 00	96 00
North American Railway Co.	39,767,200	100 00	11 25
Postal Telegraph	10,000,000	100 00	83 50
Peninsular Elec. Lt. & P. Co., Va.	30,000	10 00	9 50
Pettingell Andrews Co., Boston	200,000	25 00	30 00
Pittsburg Reduct. Co., Aluminum	1,000,000	100 00	105 00

Queen & Co., Phila....................	600,000	100 00	100 00
Rockaway Elec. Light................	50,000	100 00	40 00
Sawyer-Man Elec. Light Co., N.Y.....	125,000	100 00	100 00
Shaver Corporation, N. Y............	2,000,000	100 00	75 00
Short Elec. Ry. Co., Cleveland, O.....	5,000,000	10 00	8 00
Standard Ug'd Cable Co., N. Y......	1,000,000	100 00	80 00
Suffolk Electric Co., Boston..........	300,000	10 00	10 50
Swan Incandescent..................	800,000	100 00	6 00
The Gamewell Fire Alarm Tel. Co.....	750,000	100 00	100 00
The Hall Signal Co., N. Y............	1,900,000	100 00	100 00
The Hall Signal Co. pref., N. Y......	100,000	100 00	115 00
The Ongley Electric Co., N. Y.......	250,000	100 00	85 00
The Siemens & Halske Co., Ill........	500,000	100 00	par
The Washington Wat. Pow., Wash.....	1,500,000	100 00	90
The Wells & French Co., Ill...	600,000	100 00	par
T.-H. Electric Co. 5s, N. Y....	500,000	30 00	*101
U. S. Rubber Co.....................	13,481,000	100 00	45 00
U. S. Rubber Co. pref. 8s............	12,942,500	100 00	96 00
Western Union.......................	100,000,000	100 00	97 75
Westinghouse Elec. & Manf. Co... ..	7,000,000	50 00	36 00
Westinghouse Elec. Co. pref. 7s.......	4,000,000	50 00	49 25
West Point W. Lt. & P. Co., Va......	25,000	100 00	101 00

*Per cent. †Registered stock.

FINANCIAL.

The full business expected, at least in amount, has continued from the first of the year and still rules. There must be many schemes which were not prepared to come before the public so early, and most of these will be left over till fall. With the advent of the first sunny or spring week the Stock Exchange matters of the whole winter among the merchants will be closed out to the best advantage, or, like all other last season's goods, be stowed away to make room for the new current business. The Chicago fair will try hard to open in May, but it will, no doubt, require six weeks more to get things to run smoothly; meantime, all steps will lead to Chicago. Little aid can be expected from Europe this year. The past year has been sufficiently hard to try men's souls, with little or no daylight in sight, and it permeates the whole country. Their imports of gold simply make them poorer, for they have not earned it in trade from us and must pay a little to somebody for the privilege of having it in their possession. It will return either with this added or some of our securities will be sacrificed at a price to suit, which pleases us still better. The tide of travel across the ocean will be much less this year on account of the fair, and although the same goods cannot be purchased, the same, and I am inclined to think more, money will be spent over the counter. If the large banks and clearing-houses of the large cities can arrange through branches to cash all checks in Chicago or clear them, there will be no need whatever for any ripple in the financial departments during the whole exhibition. It surely would be no great hardship for New York to send, say, 50 paying-tellers to Chicago to either a number of branch banks or a consolidated one for three or four months. Boston, Philadelphia, San Francisco, New Orleans and other banking centres could send a sufficient number to do the business of their respective depositors just the same as it would be done at home, and with so much pleasure and satisfaction. Some discounts and commissions might be lost by the home banks in the early stages, but before the exhibition is over and the branches closed these will all equalize themselves in profits and otherwise, and the Chicago bankers will find their loss far more than made up by the gain which must follow as they get control again with their more extended acquaintance and clientele. Another gain will be from the three months' daily intermingling of so many of the banking employés from all parts of the country. The telephone and other electrical improvements meeting this year at a common centre make this plan not only feasible but desirable.

Several of the syndicates with practically no interest in the parent industry, who with large sums of pool cash have been speculating on the exchange, are closing out their purchases and winding up their pools, the whiskey and cordage being the two most prominent. The first pool could not stand prosperity and, when they saw the dollars above a certain general sum coming in from the lambs, played hob in their own camp and let other speculators reap the benefit, while they are in the soup. The second has in closing divided $1,300,000 cash, and has $1,200,000 yet to divide, or possibly to form another pool with. A legitimate pool of this kind managed by a competent man in the interest of the electrical securities would have a wonderful effect and should not conflict with the investors. The electrical industries require far more money to develop their business than they can get, and the speculator makes it possible to market the securities and get the corporation in working order, then he sells out and seeks other fields, but the work is done and the condition is just such as the investor desires—safe, steady, growing, sure and permanent. The solid syndicates, buying up kindred industries, amalgamating, completing and selling them back to the people, will this year make a record never imagined possible before, and while they make a very large profit we shall all benefit to a considerable extent. Get electrics in the lead.

FINANCIAL NOTES.

It has been resolved to voluntarily wind up the Law's Electrical Appliances Company (limited), 40–42 Queen Victoria street, London, E. C., England.

Messrs. J. H. Duncan and B. H. Van Tromp, of 39 Coleman street, London, E. C., have been appointed liquidators in the winding-up of the Australasian Electric Light, Power and Storage Company (limited). All claims must be sent in by March 4.

CLAUS DYNAMOS.

The following is a copy of a letter from John Thompson, engineer of the Manhattan Opera House, New York city, to P. Claus & Co., 357 West 40th street, concerning the performance of P. Claus dynamos under his charge. The letter is dated December 20, 1892, and reads:

"I have your letter of even date requesting me to state the results of dynamos delivered by you, and beg to say with pleasure that I handled your dynamo (600 L. machine) at the Harlem Opera House, 125th street, for four years to my entire satisfaction. Same is of a capacity of 300 ampères, 110 volts, and runs sometimes with an overload for about 35 ampères without any sparking.

"We are switching on or off during the performance as may be necessary up to the full load; and this is the only dynamo I have found which will, if necessary, take up the full load instantaneously.

"The dynamo is running on an average eight hours a day, and has given us no trouble or needed any repairs whatever; the only expense attached to the machine has been a set of brushes.

"About four months ago, when Oscar Hammerstein erected the new Manhattan Opera House, 34th street near Broadway, I, as chief electrician and constructing engineer, had the choice to select any make of dynamos to suit his purpose, and, without hesitation, I recommended the P. Claus dynamos, which were accepted, and are now in successful operation at above building. One multipolar of 600 ampères, 110 volts, and one bipolar of 300 ampères, 110 volts, are running, and I would be pleased to have purchasers inspect same, that they may see their splendid results.

TRADE NOTES.

J. W. Parker & Co., Philadelphia representatives of the Ball Engine Co., Erie, Pa., are installing an 80 H. P. Ball engine at Malden, W. Va., for experimental mining haulage.

THE Buckeye Electric Co. reports an enormous sale of "Buckeye" lamps for the months of December and January. Stocks are carried at Chicago and New York branches, insuring prompt deliveries. The coil filament in both the 16 and 32 C. P. lamps is in great demand.

MR. W. R. MASON, the general manager of the Railway Equipment Company, Chicago, has just sent out a circular to the Eastern trade calling attention to the unequalled facilities of the company for furnishing everything necessary for the complete equipment and maintenance of electric roads, and also calling particular attention to the merits of the type "G" overhead material manufactured by his company. This material, he says, has been specified on a majority of the leading roads during the last season.

"MOST VALUABLE AND SATISFACTORY."

"We have used electro-medical apparatus of many different makers, and can truthfully say that those made by Jerome Kidder Manufacturing Co., 820 Broadway, New York, have proved to be by far the most valuable and satisfactory in every respect."—*Texas Courier Record of Medicine*, January, 1893.

The Electrical Age's Illustrated Record of Patents.

Issued February 7, 1893.

491,095. Electric-Arc Lamp. Wallace E. Freeman, Long Island City, assignor to Lawrence M. Closs, New York, N. Y. Filed July 8, 1892.

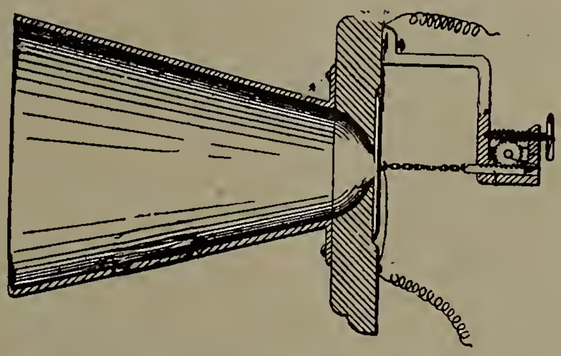
491,106. Bipolar Electrical Machine. Thomas H. Hicks, Detroit, Mich., assignor of one-half to George F. Case, same place. Filed Feb. 8, 1892.

491,109. Telephone-Cable. Silas W. Holman, Boston, Mass. Filed Nov. 5, 1892.

491,124. Arc-Light Carbon. James McLaughlin, Chicago, Ill. Filed May 5, 1891.

491,132. Inclosed Conductor for Electric Railways. Frank C. Perkins, Dunkirk, N. Y. Filed May 27, 1892.

491,133. Printing-Telegraph Receiver. Major D. Porter, Brooklyn, N. Y., assignor to the National Ticker Company, of West Virginia. Filed Dec. 10, 1891.



491,275.—TELEPHONE TRANSMITTER.

491,208. Insulator-Clip. William H. Edmunds, New York, N. Y. Filed Aug. 9, 1892.

491,250. Testing Apparatus for Multiple-Switchboard Systems. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Sept. 9, 1890.

491,251. Duplex Electric-Arc Lamp. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Oct. 20, 1890.

491,252. Metallic Circuit for Multiple-Switchboard Systems. John A. Seely, New York, N. Y., assignor to the Western Electric Company, Chicago, Ill. Filed Nov. 15, 1886.

491,268. Lamp-Socket. Edwin R. Elliott, Litchfield, Ill. Filed March 28, 1892.

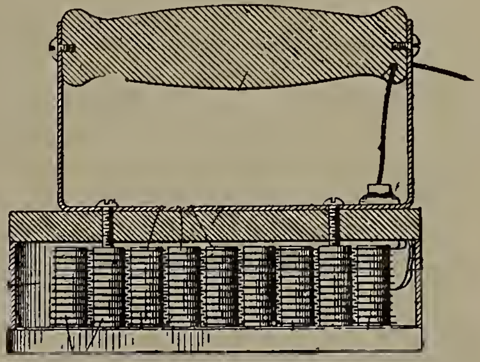
491,275. Telephone-Transmitter. Harry L. Tyler, Corning, N. Y. Filed May 13, 1892.

491,294. Dynamo-Electric Machine. Gabriel V. M. A. Parrot and Antoine C. Reignier, Paris, France. Filed Aug. 3, 1892. Patented in France, Belgium, and in England.

491,311. Electrically-Heated Soldering-Iron. Samuel B. Jenkins, Boston, Mass., assignor, by mesne assignments, to the American Electric Heating Company, same place. Filed June 8, 1892.

491,312. Electrically-Heated Smoothing-Iron. Samuel B. Jenkins, Boston, Mass., assignor, by mesne assignments, to the American Electric Heating Company, same place. Filed June 8, 1892.

491,313. Electric Curling-Iron Heater. Samuel B. Jenkins, Boston, Mass., assignor, by mesne assignments, to the American Electric Heating Company, same place. Filed June 8, 1892.



491.312.—ELECTRICALLY HEATED SMOOTHING IRON.

491,320. Electric Water-Heater. Willis Mitchell, Malden, assignor, by mesne assignments, to the American Electric Heating Company, Boston, Mass. Filed June 8, 1892.

491,321. Electrically-Heated Vessel. Willis Mitchell, Malden, assignor, by mesne assignments, to the American Electric Heating Company, Boston, Mass. Filed June 8, 1892.

491,322. Electrically-Heated Gridiron. Willis Mitchell, Malden, assignor, by mesne assignments, to the American Electric Heating Company, Boston, Mass. Filed July 2, 1892.

491,339. Electric Clock. John H. Dyson, Belleville, Wis. Filed June 6, 1892.

491,346. Electro-Mechanical Movement. Elisha Gray, Highland Park, Ill. Filed Jan. 8, 1892.

491,347. Telautograph. Elisha Gray, Highland Park, Ill. Filed Sept. 21, 1892.

491,362. Insulator. Augustus R. Lane, New York, N. Y., Filed May 13, 1892.

PATENTS—Continued.

491,369. Electric Lock. Oliver A. Moyer and Henry W. Rhodes, Ogden, Utah. Filed April 9, 1892.

491,387. Electric Circuit for Railway-Signalling. Louis Thaler, New York, N. Y. Filed Aug. 24, 1892.

491,394. Process of Electrically Reducing Aluminum and forming Alloys thereof. Thomas L. Willson, Brooklyn, N. Y. Filed March 25, 1891.

491,426. Combined Electric Switch and Door-Lock John H. L. Holcombe, U. S. Navy. Filed Oct. 24 1892.

491,437. Electric Metal-Heating Device. Willis Mitchell, Malden, assignor to the American Electric Heating Company, Boston, Mass. Filed June 16, 1892.

491,438. Electrically-Heated Muffle. Willis Mitchell, Malden, assignor to the American Electric Heating Company, Boston, Mass. Filed July 5, 1892.

491,457. Electrical Measuring-Instrument. Elmer G. Willyoung, Philadelphia, Pa., assignor to Samuel L. Fox and Edward B. Fox, same place. Filed Aug. 11, 1892.

491,465. Electrical Transmission of Power. Charles S. Bradley, Avon, N. Y. Filed April 4, 1892.

491,483. Switch for Electrical Tram-Cars. Moritz Immisch, London, England, assignor to the Immisch Electric Navigation and Power Company of New Jersey. Filed Nov. 21, 1891. Patented in England.

491,484. Electrically-Heated Vessel. Samuel B. Jenkins, Boston, Mass., assignor to the Butterfield-Mitchell Electric Heating Company, same place. Filed June 9, 1892.

491,490. Insulation of Dynamo-Armatures. Thomas E. Morford, Minneapolis, Minn., assignor, by direct and mesne assignments, of one-half to the Enamel Insulator Company of Illinois. Filed Jan. 28, 1891.

491,491. Insulated Magnetic Coil. Thomas E. Morford, Minneapolis, Minn., assignor, by direct and mesne assignments, of one-half to the Enamel Insulator Company of Illinois. Filed Jan. 28, 1891.

REISSUE.

11,306. Multiple-Switchboard System. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Nov. 6, 1891. Original No. 442,143, dated Dec. 9, 1890.

VULCANIZED FIBRE COMPANY,
Established 1873.
Sole Manufacturers of HARD VULCANIZED FIBRE,
In Sheets, Tubes, Rods, Sticks and Special Shapes to order. Colors, Red, Black and Gray. Send for Catalogue and Prices.
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THE CLARK COMPANY, NEW YORK, 192 BROADWAY,
CLARK is the only Company in the United States that makes a specialty of manufacturing under own patents, Electric Arc Lighting Apparatus for every purpose, including the finest arc lamp in every respect, suitable for any class of interior lighting, with plain or ornamental fixtures, and can be used on incandescent circuits, on any voltage from 65 upwards, in series or single, or on arc circuits of standard current.

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Scrap and Native Platinum Purchased.
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BATTERY ZINCS
RODS AND PLATES FOR BATTERIES.
H. LAMARCHE'S SONS,
33 John St., N. Y.

ELECTRICAL AGE

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THE LAMP SUIT.

The now celebrated case of the General Electric Company against the Beacon Vacuum Pump and Electrical Company, of Boston, has at last been decided. Judge Colt, in the United States Circuit Court, Boston, on Saturday last, granted the application of the General Electric Company for an injunction against the Beacon Vacuum Pump and Electrical Company to restrain the latter from making incandescent lamps which infringe the Edison patents. The Beacon company claimed that the Edison patent was invalid for want of novelty. This position taken was based on the allegation that Henry Goebel, a German watchmaker, invented the incandescent lamp in 1854. Affidavits were presented from various persons in support of this claim, which testimony was discredited by affidavits in support of the plaintiff's case. Judge Colt reviews these and concludes that it is extremely improbable that Goebel constructed a practical electric lamp in 1854.

Lamp No. 4, which formed a part of the evidence of the defendant company, the judge regards with suspicion, and believes that circumstances connected therewith throw considerable doubt on Goebel's story.

The judge, in closing his decision, cites a principle that should not be forgotten or overlooked. He says, "It has often been laid down that a meritorious invention is not to be defeated by something that rests upon speculation or experiment which is rudimentary or incomplete."

CONVENTION INFORMATION.

The special train which will carry the Eastern delegation to the National Electric Light Association in St. Louis, February 28, March 1 and 2, will leave New York city via the Pennsylvania Railroad, Sunday, February 26, at 12 o'clock noon. The train will leave Philadelphia at 2.25 P.M.; Harrisburg, 4.25 P.M.; Pittsburg, 10.40 P.M. (central time); Columbus, Ohio, 4:35 A.M. (February 27); Indianapolis, 10:30 A.M.; arriving at St. Louis at 5:30 P.M., Monday, February 27. An excursion rate of a fare and a third has been granted to St. Louis and return for delegates attending the convention of this association by all the passenger associations except the Western. For the convenience of passengers taking this train from New York arrangements have been made so that if they will remit to C. O. Baker, Jr., master of transportation, 136 Liberty street, New York, the amount of railroad fare ($24.25) with the sleeping-car fare ($6) a receipt will be mailed them that will be honored by the railroad company for checking baggage, ferry passage and passage through the gate at Jersey City, and exchangeable on the train for regular railroad ticket and certificate.

To secure the benefit of the reduced fare returning it will be necessary for those who do not go by the Electrical Special to be sure and state to the ticket-agent at the time they purchase the going ticket that they propose attending the meeting of the association at St. Louis, and procure from him a certificate which will entitle them, when properly vised and countersigned, to return for one-third the regular fare. No reduction can be obtained without this certificate. Immediately upon arrival in St. Louis these certificates should be left at the secretary's office, addressed to Mr. C. O. Baker, Jr., who will see that they receive the proper attention and are returned to the owners.

The St. Louis Electric Club will entertain the delegates in a very hospitable manner, and taking it altogether there is abundant reason to believe that the convention will be the most successful ever held by the association.

The official programme of the convention will be found on page 120, this issue.

ARMINGTON & SIMS ENGINES.

With the development and wide-spread use of the electric light, come the needed improvements in engines. The engines made before the stimulating effects of the introduction of electricity were soon found to be crude and unsteady when applied to the severe test of electric lighting. Among the improved engines first in the field was the Armington & Sims engine. The two-wheel double-disc standard engine is represented in figure 1.

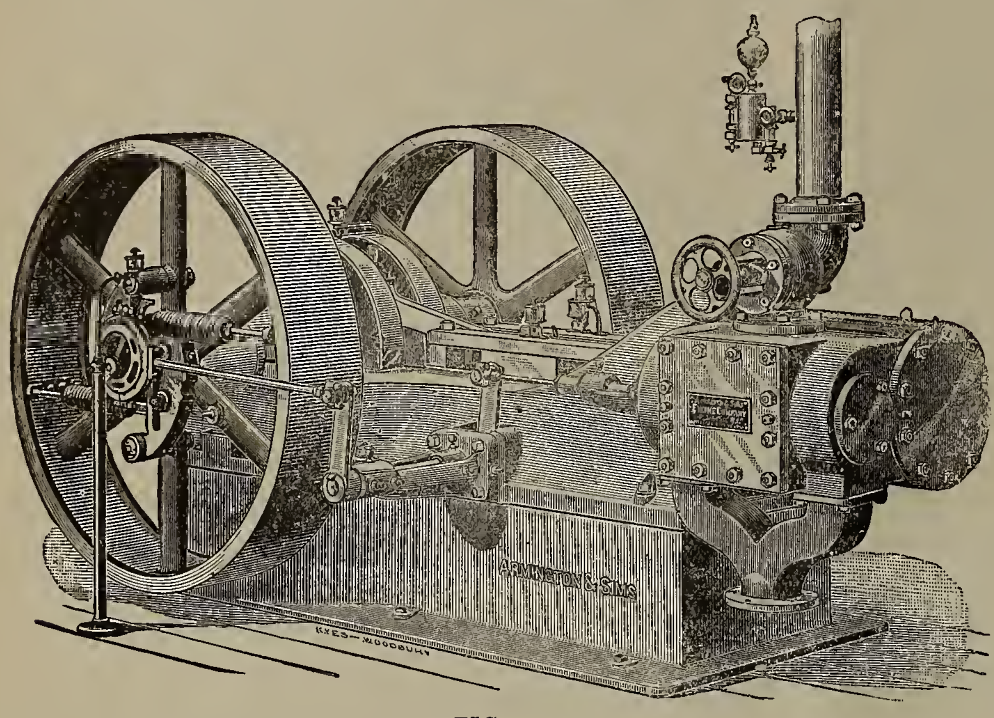


FIG. 1.

It has a very heavy bed, with interior longitudinal cross-ribs, thereby attaining stiffness. The front cylinder-head is independent of the bed and is attached to it by studs fastened from the inside. The slide-bars have large surfaces and are accurately scraped. The main-bearings are large and have adjustable cheek-pieces. The crank-shaft is solid, with large crank-pin, having two disc-plates to balance the reciprocal parts ; this enables the use of thin disc-plates, and brings the bearings close together. This is a very desirable feature, as the engines can be run at a great speed, and at the same time be heavily loaded without fear of heating. The Edison central lighting station in New York is running one of these engines having a cylinder diameter of 14.5 inches with a 13-inch stroke, giving a regular duty of 150 H. P. at a speed of 350 revolutions per minute without heating, and this without slacking speed for many days together.

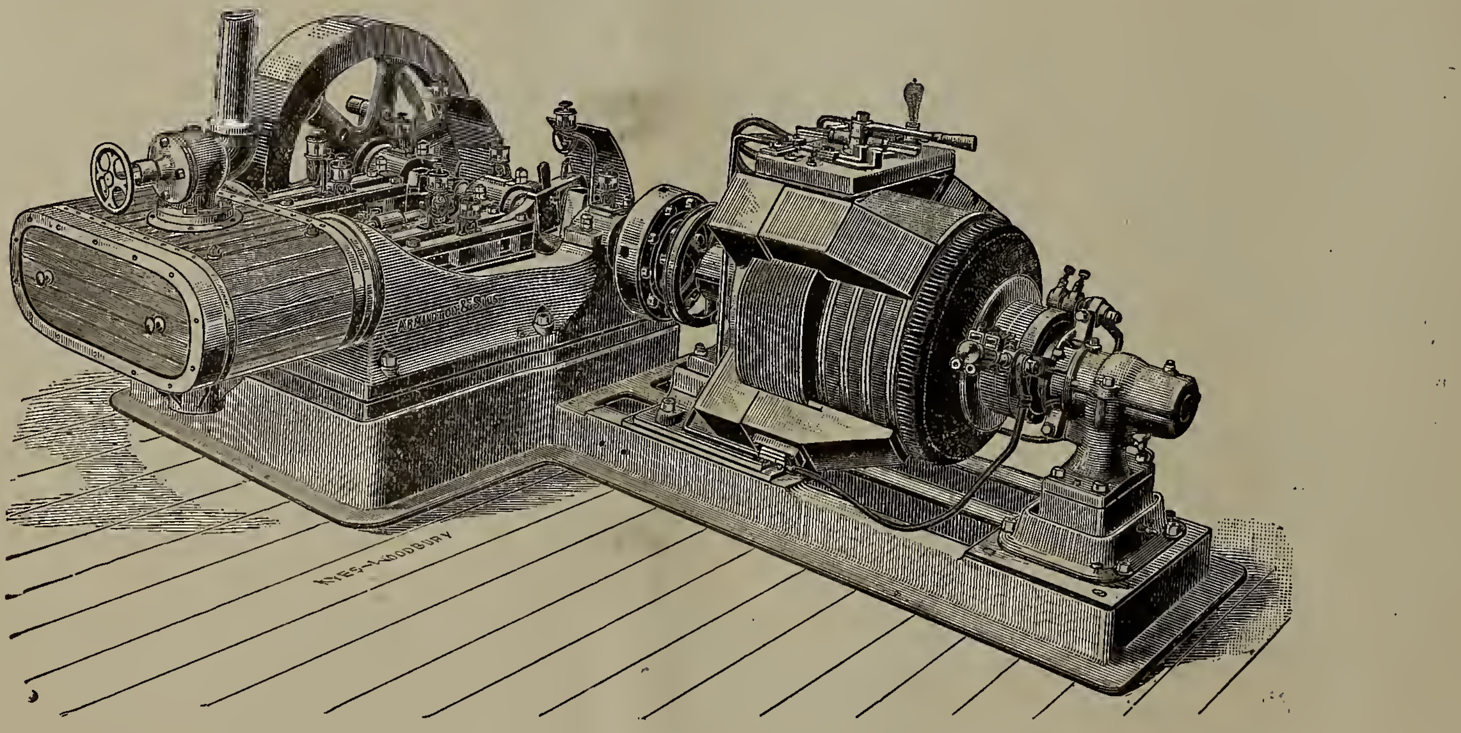


FIG. 2.

This engine has two overhanging balance-wheels, in one of which a cut-off regulator is placed. By this regulator the valve operating the eccentric is moved relative to the shaft by centrifugally acting weights, thereby varying the throw of the valve, thus governing the admission of steam to the cylinder and controlling the engine. It is stated that there are over 3,500 of them in use in different parts of the world.

Anticipating that some time there would be a demand for a first-class engine to meet the requirements of the electric systems, demanding a faster belt-speed than the Standard engine above described, there has been designed a special double engine. One of these of 100 H. P. capacity was constructed and first tested in the manufacturer's own works, and since has been in operation in the works of the Pond Machine Tool Company, Plainfield, N. J., driving the Westinghouse alternating system of electric lighting.

This engine has many desirable features over the single-acting type. It requires but half the piston area for the same power, as the steam is taken from both sides of the piston, and although the connecting rods are made 6 to 1, yet the floor-space does not greatly exceed the upright single-acting type. Thus the space occupied is economized. Having a double-ported valve for each cylinder, the waste room is very small, allowing quick steam admission.

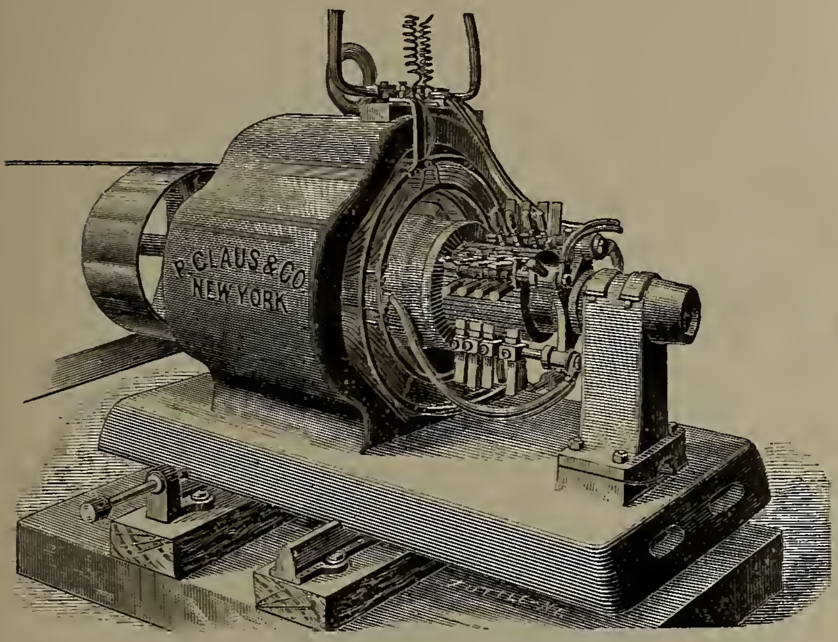
All the working parts are under the eye and care of the engineer ; the oiling can easily be attended to, and the regulator is always open to inspection. This is a great advantage over the engine having its working parts boxed in or removed from the sight and care of the person in attendance.

From the small space occupied by the engine it is particularly well suited for ship lighting, and has been adopted by the Navy Department of the United States for this purpose. It is claimed that all the new cruisers have been furnished with these engines, either horizontal or vertical. Figs. 2 and 3 show horizontal and vertical special double engines for steamships, and represent engines constructed for the Navy Department.

Edward P. Hampson & Co., of 36 Cortlandt street, New York city, are agents for these engines.

CLAUS MULTIPOLAR DYNAMO.

The accompanying illustration shows the multipolar dynamo made by P. Claus & Co., 357 West 40th street, New York city. This machine has four poles and is said to possess great efficiency in its operation. The company's bipolar machine is too well known in the trade to justify any particular notice just now, but it will be of interest to know in this connection that the multipolar machine possesses all of the advantages claimed for the bipolar dynamo, besides others of its own.



CLAUS MULTIPOLAR DYNAMO.

It has been proved by experience that it is preferable to double the magnetos in machines with a capacity of 800 or more 16 C. P. lights. The reason for this is that a large amount of wire can be brought closer to the iron, and such distribution of the wire over the iron makes the magnetic fields larger and more intense.

One great feature of these machines is their slow speed, and every mechanic knows the advantages of slow speed in any machine, whether electrical or mechanical. One of these dynamos has recently been installed in the new Manhattan Opera House in New York city, and it makes only 300 revolutions a minute.

These machines are made of a capacity of from 800 to 2,000 16 C. P. lamps. The frame and bed-plate of the machine are in one casting, the journal-bearings being separate, as shown in the illustration. The bearings are self-oiling, by means of two rings revolving on the shaft inside of the bearings in an oil reservoir.

The field-windings are removable from the cores, and compound wound.

The company is now constructing dynamos of this type to run at 250 revolutions a minute, generating a current of 325 ampères at 120 volts, and they are guaranteed to give an efficiency of 92 per cent. It is also claimed for these dynamos that change of load causes no sparking whatever at the brushes. They run absolutely noiseless, and the wear on the commutator is reduced to a minimum.

The company especially recommends these machines as railway generators and car motors.

Solidity of construction is one of the visible features of this dynamo, and the workmanship is of a high character. This excellence in construction secures smooth running and durability.

Another advantage possessed by the multipolar machine is the fact that it is a covered structure, thus being protected against external injury, particularly during transportation.

All the parts of the machine are readily accessible, and therefore easily repaired.

The commutators are made exclusively of Eureka tempered copper, made by the Eureka Tempered Copper Co, of North East, Pa., and the Claus Company guarantees each machine for one year from the date of its delivery.

FROM WASHINGTON TO PHILADELPHIA BY TROLLEY.

Messrs. Widener and Elkins, of the Philadelphia Traction Company, have street-railway interests in both Washington and Baltimore. In the latter place they are manipulators of the Baltimore Traction Company, and in the former they have purchased a controlling interest in the Belt Line Railway, which traverses the more important parts of the city; and it is said that they are negotiating for two more lines, the Metropolitan and the Columbia companies.

For some time these gentlemen have had in view the project of connecting Washington and Baltimore by electricity, but they have carefully kept the exact route a secret. It is proposed to use the trolley system of electric locomotion, with feeders at each end of the line. This road will connect the business centres of both cities, and it is expected that it will not be long before the work of construction will be commenced.

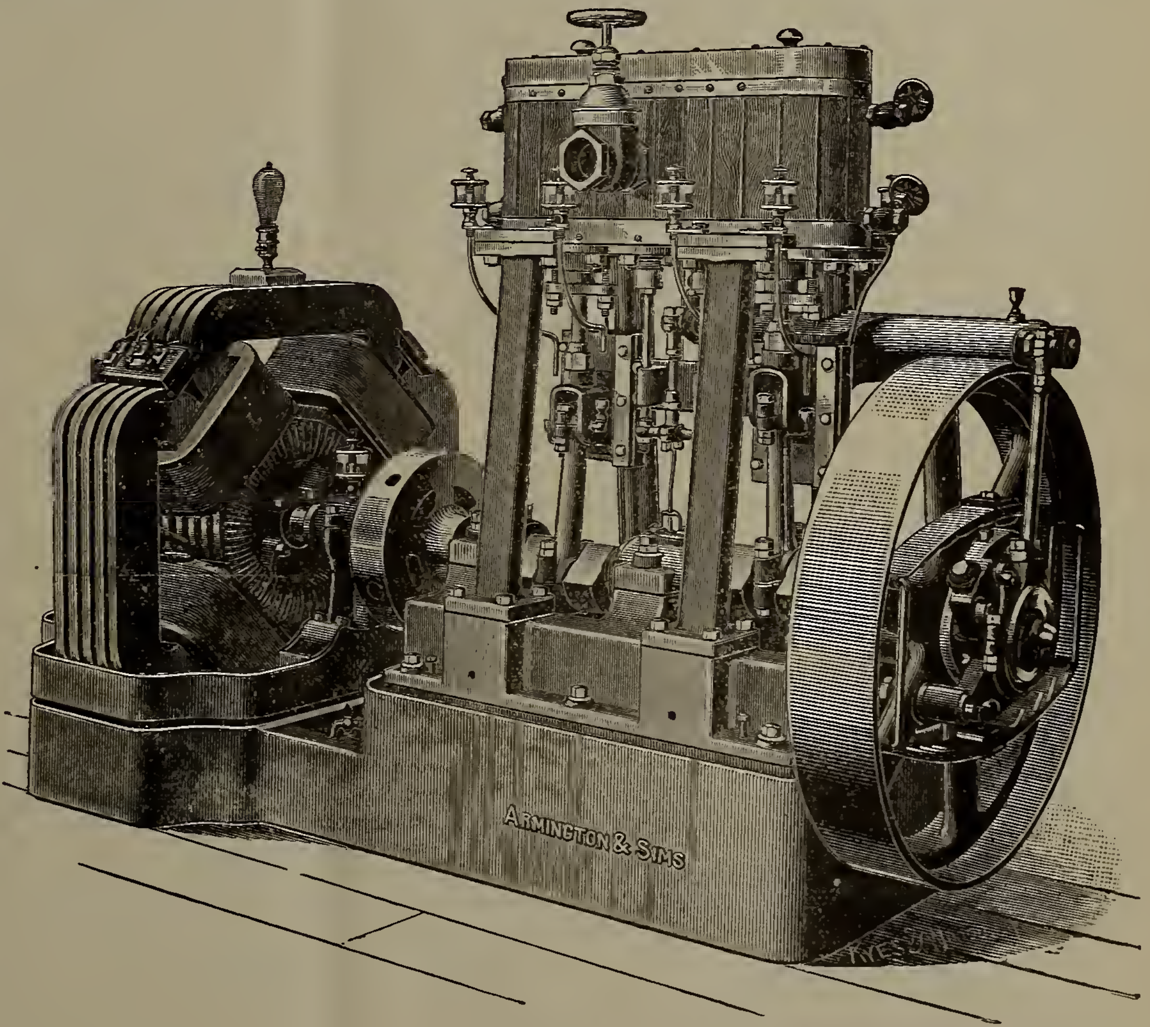


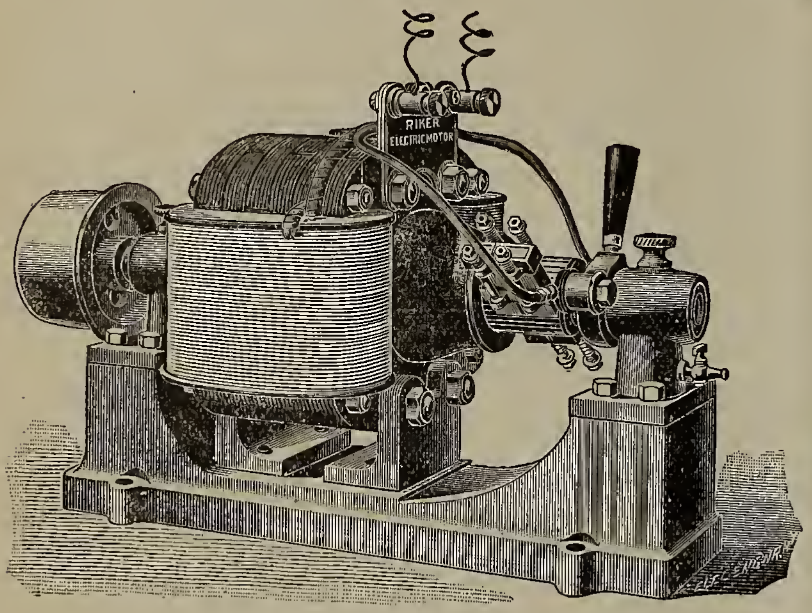
FIG. 3.—ARMINGTON & SIMS ENGINES.

The Philadelphia Traction Company is at work in Pennsylvania, and it is rumored that the proposed road will be extended from Baltimore to Philadelphia. It already has six miles of road toward Baltimore from Philadelphia by means of the Philadelphia and Darby

Passenger Railway, at the same time having a charter to construct a road in Lancaster. A bill is pending in the Pennsylvania legislature to permit traction companies to acquire street railways with the consent of the local authorities. This, if passed, will enable the company to extend its line to the southern borders of the State, absorbing the roads at Chester and other desirable places.

A bill has also been introduced into the legislature giving all corporations the privilege of increasing their capital stock to $30,000,000. This will give the traction company plenty of funds with which to carry out its project.

It is reported that these gentlemen are at work in Delaware to obtain franchises for lines to be the connecting links between the Pennsylvania and Maryland companies. The basis of this seems to be that a company, the identity of whose backers is carefully concealed, is endeavoring to obtain a charter to build a trolley line in Wilmington, and to extend to other Delaware towns. The Wilmington City Passenger Railway Company opposes this new company, and its application for a charter is hotly contested in the Delaware legislature.



"RIKER" BIPOLAR DYNAMO.

Messrs. Widener and Elkins admit that they will connect Baltimore and Washington by a trolley road, but they are reticent about the extension of such a line northward from Baltimore to Philadelphia.

"RIKER" DYNAMOS.

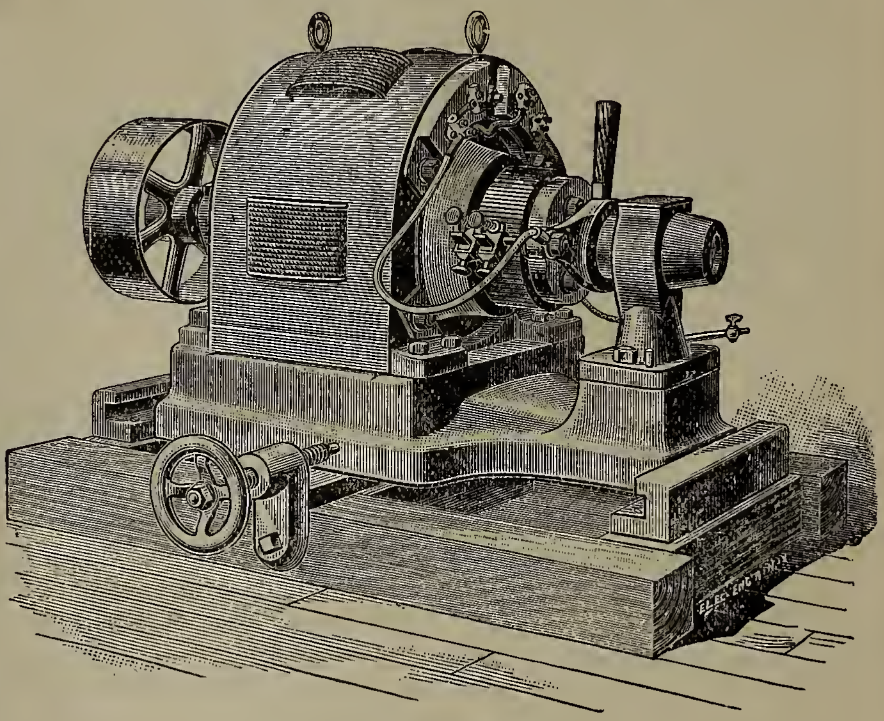
In the Electrical Age of February 11 descriptions were given of two styles of marine dynamo and engine plants made by the Riker Electric Motor Co., of Brooklyn, N. Y. Illustrations of these machines were also given, the dynamos being of the bipolar and multipolar types, and connected directly to the engine-shaft.

We give herewith illustrations of the standard dynamos of the bipolar and multipolar types, which are designed to be run by belts. The bipolar machines are for use where the number of lights does not exceed 100; for a greater number the multipolar machine is intended.

In the bipolar dynamo the field-cores are built up with laminations of soft iron, and their form is such as to produce an intense field about the armature. It is a very simply constructed machine, as may be seen from the illustration. The bearings are self-oiling and the whole machine is very compact and efficient. The regulation is perfect and automatic, and a light of uniform brilliancy under varying conditions of load is produced.

The multipolar machine has four poles, and with the exception of the difference in the form of the heavy castings it does not differ much in essential particulars from the bipolar dynamo. The machine, it will be observed, has a sliding base to secure the proper tension on the belt. It is simply constructed and the bearings are ample and self-oiled.

All the multipolar dynamos of this make run at the uniform velocity of 600 revolutions a minute, while the lowest speed of the bipolar machine is 1,200 revolutions.



"RIKER" MULTIPOLAR DYNAMO.

Bipolar dynamos are made in 7 sizes varying from 8 to 100 16 C. P. lamps and .5 to 6 K. W. capacity. The multipolar machines are made in 6 sizes varying from 150 to 800 16 C. P. lamps and 9 to 45 kilowatts.

NOVELTIES IN TROLLEY-LINE MATERIAL.

We call attention again this week to more novelties in line material manufactured by the New York Electrical Works, of No. 161 Washington street, New York city, and various new shapes in which they are putting the Midbery insulation on the market.

The Midbery insulation is a new compound of highest grade material moulded into shape under enormous hydraulic pressure. It is claimed to be the very best material that has been adapted to trolley-line work, and from a careful examination it looks as if it was well able to substantiate these claims. It is, we are informed, as

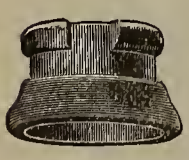


FIG. 1.

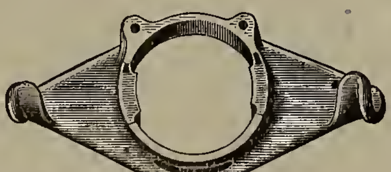


FIG. 2.

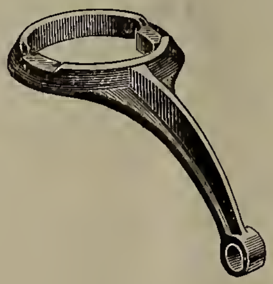


FIG. 3.

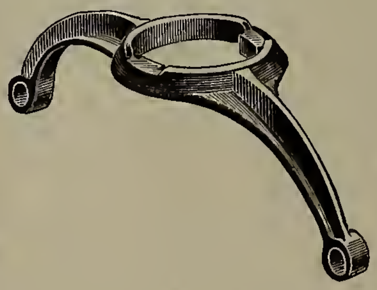


FIG. 4.

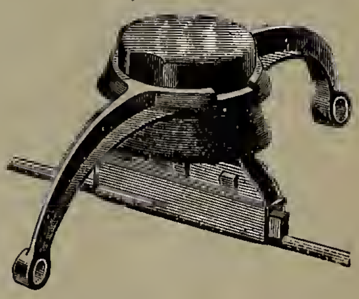


FIG. 7.

low in price as any high-grade insulation on the market.

Fig. 1 shows the new universal bell, fitted with ⅝-inch bushing to fit mechanical clip or strain-ear. Figs. 2, 3 and 4 represent hangers to fit this bell, making a straight-line hanger, single and double pull-offs. Figs. 6 and 7 show clip attached. Fig. 5 is a frog pull-off.

Figs. 8, 9 and 10 show the insulation moulded into the old forms of straight-line hanger, etc., all in one piece, while Fig. 11 shows a modification of the mechanical clip into a strain-ear.

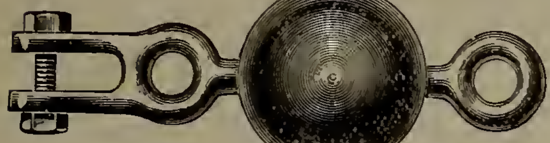


FIG. 5.

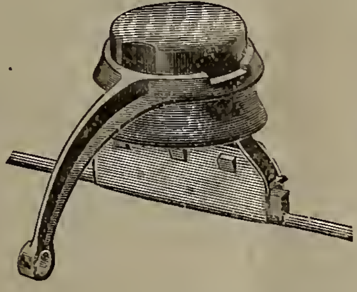


FIG. 6.

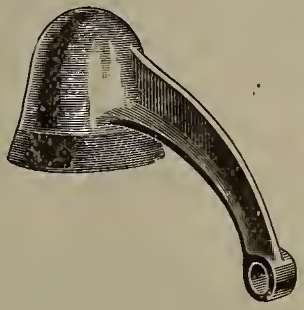


FIG. 8.

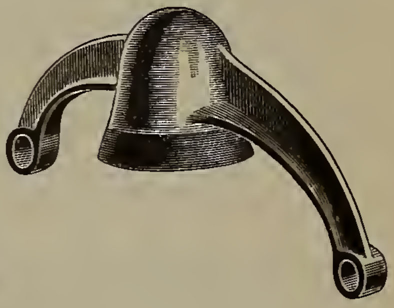


FIG. 9.

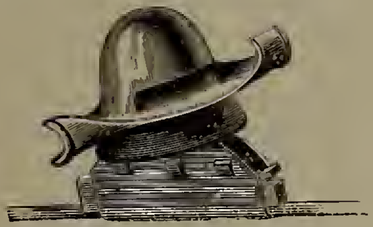


FIG. 10.

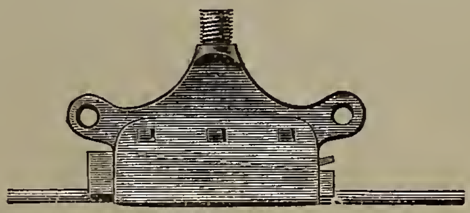


FIG. 11.

The advantage claimed for the devices represented by Figs. 1, 2, 3 and 4 is that in case of accident of any kind to the insulation or clip they can be removed and replaced without in the least interfering with the span-wires.

The locking device is a wedge dropped into a slot, and is very simple and effective, while at the same time easily removed without damage.

"WEST END" FOUR-WHEEL TRUCK.

The extraordinary wear and tear imposed upon electric street-car trucks under the new conditions of electric power made it necessary at the beginning to make many radical improvements on the old style of trucks. Engineers and inventors soon became aware of this fact, and the result has been the production of various trucks that meet the exacting requirements of electric-car service with a more or less degree of success. The West End Street Railway Company, of Boston, was one of the first to look about for a truck that would satisfactorily fulfil every requirement of its extensive electric street-car service, and after five years' experience the "West End" four-wheel truck, shown in the accompanying illustrations, is the result.

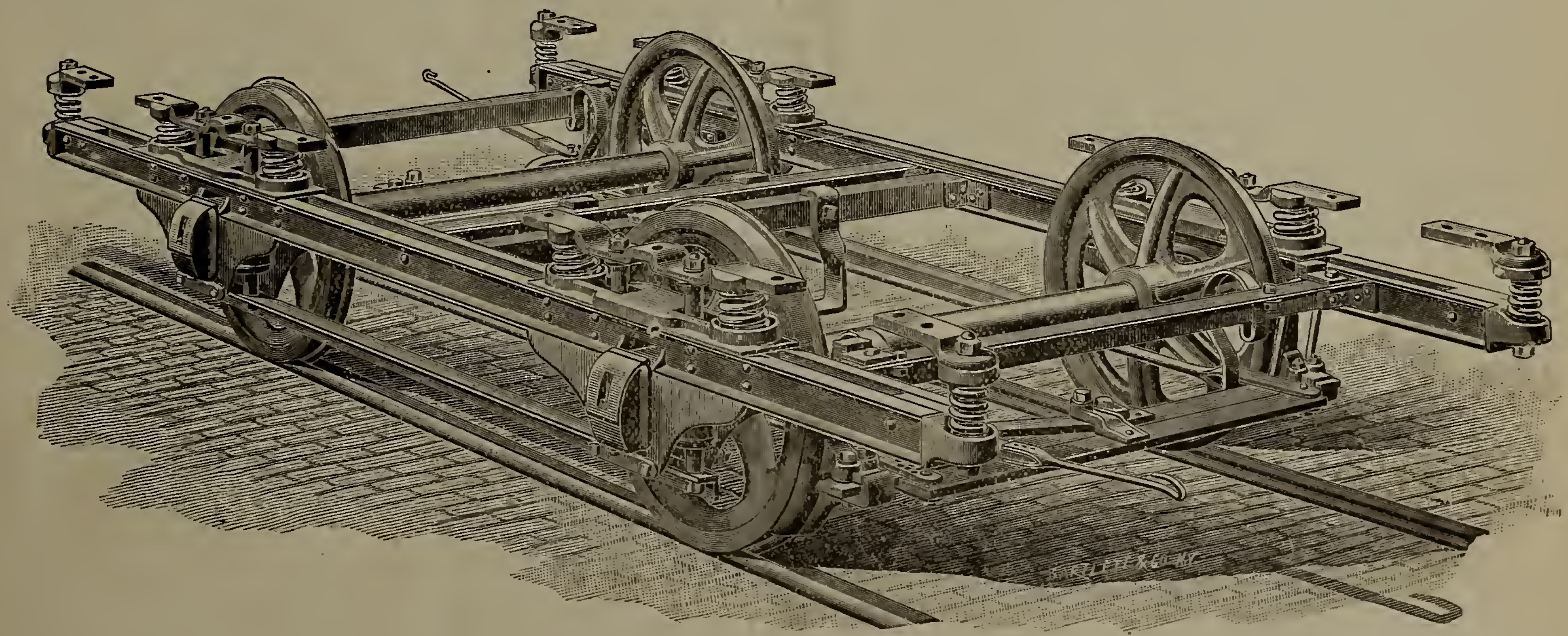


FIG. 1.

The Globe Iron Works, 556 West 34th street, New York city, of which Edward C. White & Co. are the proprietors, are the manufacturers of this truck. Perspective, plan and cross-sectional views of the "West End" four-wheel truck are shown in Figs. 1, 2 and 3 respectively. This truck possesses the following general advantages: it is simple and durable; suitable for a car-body of any length, either open or closed, and it will not "plunge."

Any size or make of motor can be used on this truck, especially the larger ones, 40 or 50 H. P., and all the parts are interchangeable, thus rendering repairs easy. The springs are of the spiral class and of uniform material, and the truck-frame being supported on independent springs insures long life to the truck and easy riding. The distance between the end springs is 14 feet, and the length of the sill-plate is said to be greater than that of any other truck on the market. The brake mechanism and boxes are thoroughly cushioned, which does away with all noise in operation, and there is no danger of the car leaving the track when only one motor is used.

The following points of superiority are claimed for this truck by its makers: Extreme simplicity in design; great durability; largest axle journal used on any electric truck on the market; simplest and most durable box; easy riding; simple, quick-acting and flexible brake; adaptability to any climate; less plunging than any other truck; strength; ease and cheapness of repairs; can be used equally well on a 16, 18 or 20-foot body, and has fewer rivets and bolts than any other truck.

The truck complete, including motor-hangers and brake-gear, weighs 4,300 lbs., the wheels being 33 inches in diameter. The wheel-base is 6 feet, 6 feet 6 inches or 7 feet, and the distance from the track to the top of the channel-iron, with 33-inch wheel, is 30 inches.

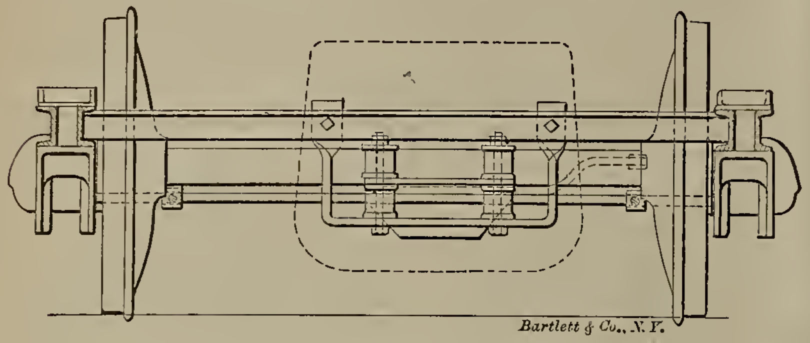


FIG. 3.—" WEST END " TRUCK.

SUBURBAN UNDERWRITERS.

At the meeting of the executive committee of the Suburban Underwriters' Association, New York, held on Tuesday, February 7, Mr. Fremont Wilson was appointed as consulting electrician for said association. Rules governing the installing of electric light, heat, and power installations have been recommended, and are the same as those recommended by the United Association of Underwriters' Inspectors, of which Mr. C. M. Goddard, of the New England Exchange, is secretary.

Insurance companies and brokers throughout the district covered by said association have been notified that electric-light privileges will hereafter be given only to parties whose installations have been certified to by Mr. Wilson. Electric light and power companies and contractors will be furnished with printed rules and regulations and blank forms of application, to be signed by all parties doing work in their district. The territory at present under the jurisdiction of this association is Queens, Suffolk, Westchester, Putnam and Rockland counties. Richmond County is practically under the jurisdiction of the association, and the same rules and regulations will undoubtedly be required there.

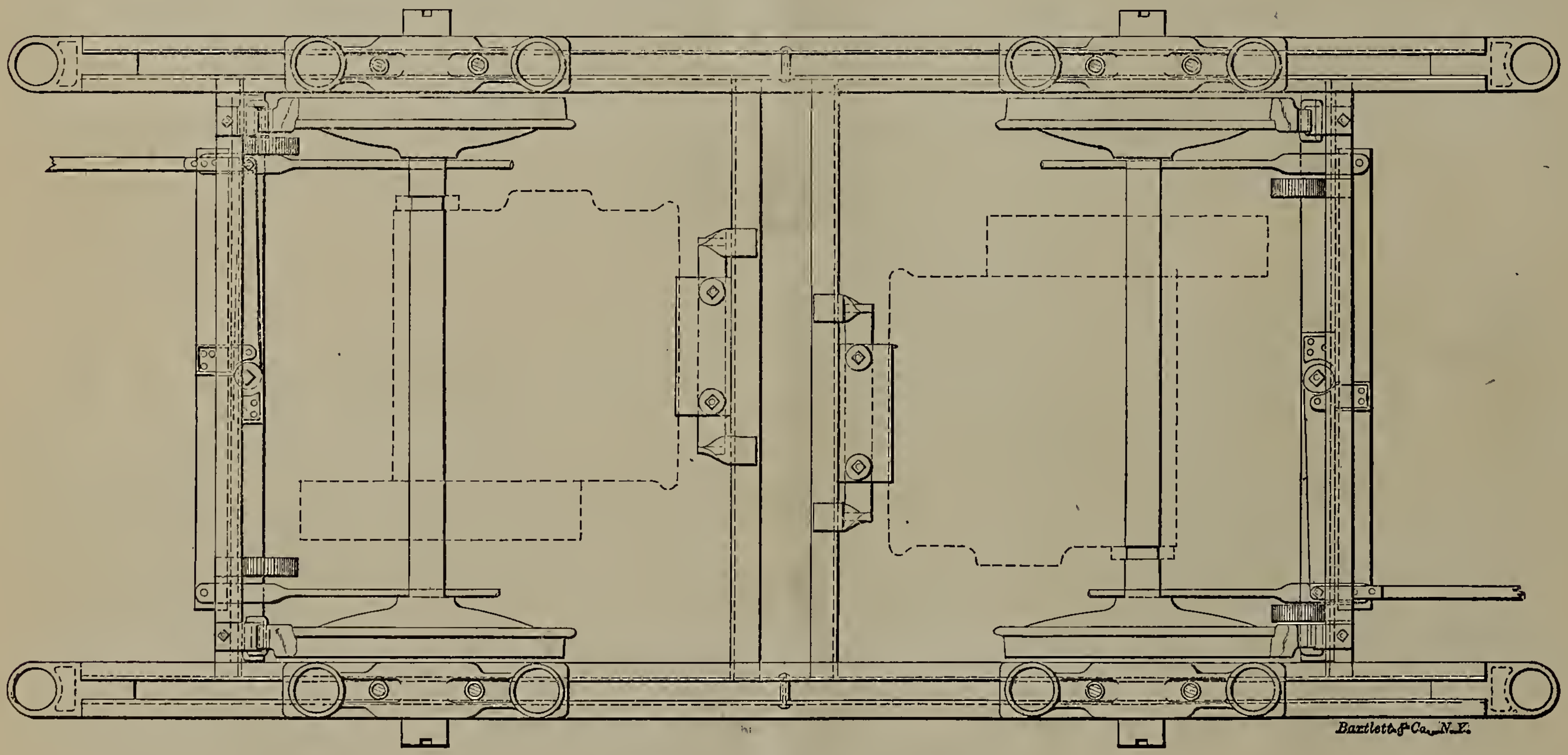


FIG. 2.—" WEST END " TRUCK.

Any information which parties may desire will be furnished by Mr. H. E. Bowers, secretary of the association, No. 44 Pine st., New York city.

LONG-DISTANCE TELEPHONE STATISTICS.

On December 1, last, the Long Distance Telephone Company's published list showed a total of 649 offices, extending over the territory limited by Boston on the east and Milwaukee on the west. The existing lines run as far north as Saratoga and south to Washington. The basis of charge for conversation between any two points is five minutes of time, the mininum charge being 15 cents and the maximum $9.75—the latter being between New York and Milwaukee, Wis. The five minutes' limit does not include the time taken up in calling, making connections, etc. The rate to Chicago from New York is $9 for five minutes. Night rates are half the day rates when the latter are $1.50 or $2.00 and above. Below these figures down to 50 cents the reduction is not so great. At the 50-cent day rate there is no reduction at all for night service.

NEW BOOKS.

Electrical Experiments. A Manual of Instructive Amusement. By G. E. Bonney. Cloth, and 144 illustrations. London and New York: Whittaker & Co. Price, 75 cents.

There is no method of teaching a novice so much of any subject as the method of making it pleasant and amusing. This book is designed to occupy the spare time of persons not fully acquainted with the subject under consideration, and yet back of it all is the foundation and preparation for more advanced work. The subjects of electro-magnets, induction coils and static electricity, are treated in a popular yet clear style which commends the book to any one desiring to obtain even more than a rudimentary knowledge of magnetism and electricity.

SHULTZ BELTS.

"It belts the earth and makes the moon spin like a top," is what the Shultz Belting Company, of St. Louis, says of its patent Sable rawhide belting. We cannot say positively that we know that the moon acquires its rotary motion from the planet we are more familiar with by means of Sable rawhide belting, but we are inclined to believe that there is some truth in the statement that the earth is in one sense belted by it. Inasmuch as the company maintains agencies all over the world it would seem that its belts may be found widely scattered over the face of the globe.

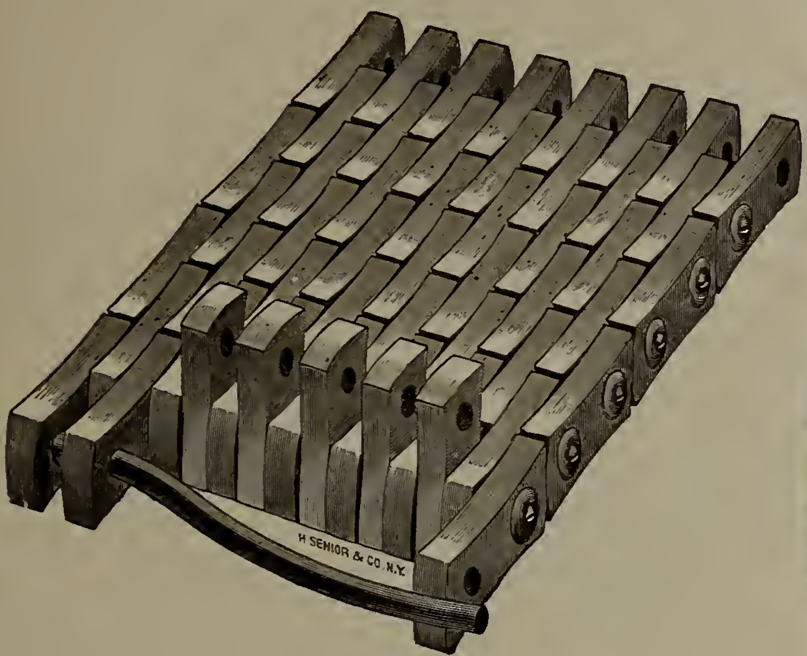

H SENIOR & CO. N.Y.

FIG. 1.

The Shultz Belting Company was established 17 years ago, and it has now one of largest factories in the world, and is at the present time engaged in making the largest belt in the world. This belt will be 80 inches wide—nearly seven feet. A view of the company's factory is given herewith (Fig. 7), from which some idea of the extent of the business may be imagined.

FIG. 4.

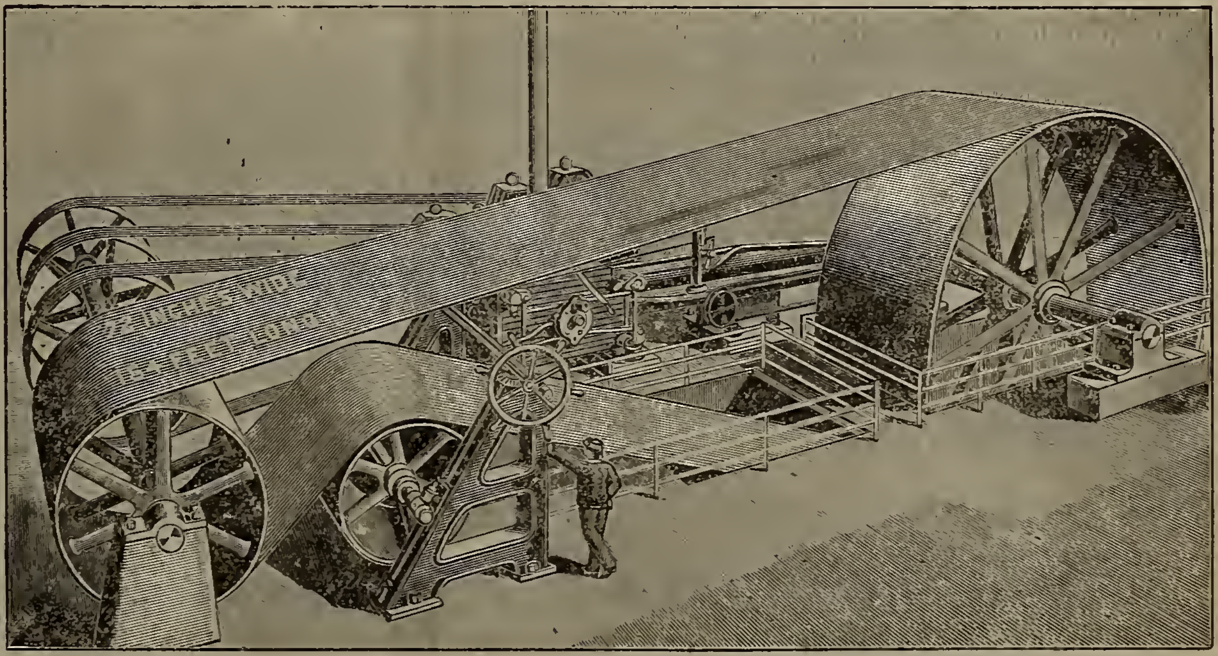


FIG. 5.

It does not require any argument to demonstrate the great importance of belting in factories and other places where transmission of power is necessary, and all users of belting know a poor quality of belting means great loss to the manufacturer or operator of the plant. A first-class and reliable belt therefore is something that will always find a market. The Sable rawhide belting made by the Shultz Belting Co. is said to fulfil all of the necessary requirements of a first-class belt, and possesses none of the disadvantages of other makes. It is claimed that it transmits from 25 to 33 % more power; can run slacker; is more durable; more pliable; runs true; is unaffected by atmospheric changes, and has a minimum of stretch. The Sable belting is tanned only on the surfaces, having the rawhide interior untouched. The interior portion constitutes the fibrous part of the hide, and it is made soft and pliable by the company's patent process. This gives all the advantages of tanned leather and at the same time retains the strength of the rawhide. The pliability and softness of this belting make it especially adapted in places where high speeds have to be maintained on small pulleys and where they have to run on a twist.

The hide is carefully stretched before being made into belting and the belts are carefully put together, short lap being guaranteed. These belts have been used for 16 years all over the United States and Europe, and it is said have sustained their reputation. As an indication of the genuineness of the Sable belting the company stamps the word "Sable" every ten feet, and if this word is not found at such intervals it is safe to assume that the Shultz Belting Company repudiates any responsibility for the goods.

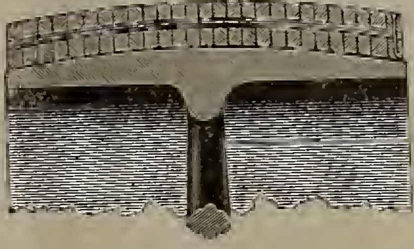


FIG. 2.

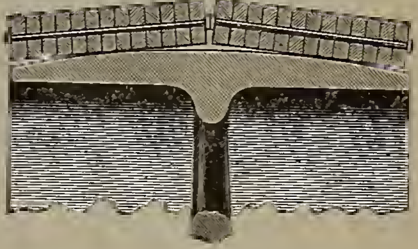


FIG. 3.

Fig. 1 shows a section of Shultz's patent woven leather (link) belt. In the construction of this belt no iron rods are used; nothing but rawhide leather throughout.

The advantage of this method of construction will be readily understood by reference to Figs. 2 and 3.

Fig. 2 shows how closely the belt fits the crown of the pulley, touching every part, and by this greater contact the power is greatly increased.

Fig. 3 shows the slight contact between an iron rod and hinge centre belt with the crown of the pulley. It tells its own story. There is obviously great loss of power and uneven wear.

The woven leather belt is guaranteed to have more driving-power than any link belt placed upon the market.

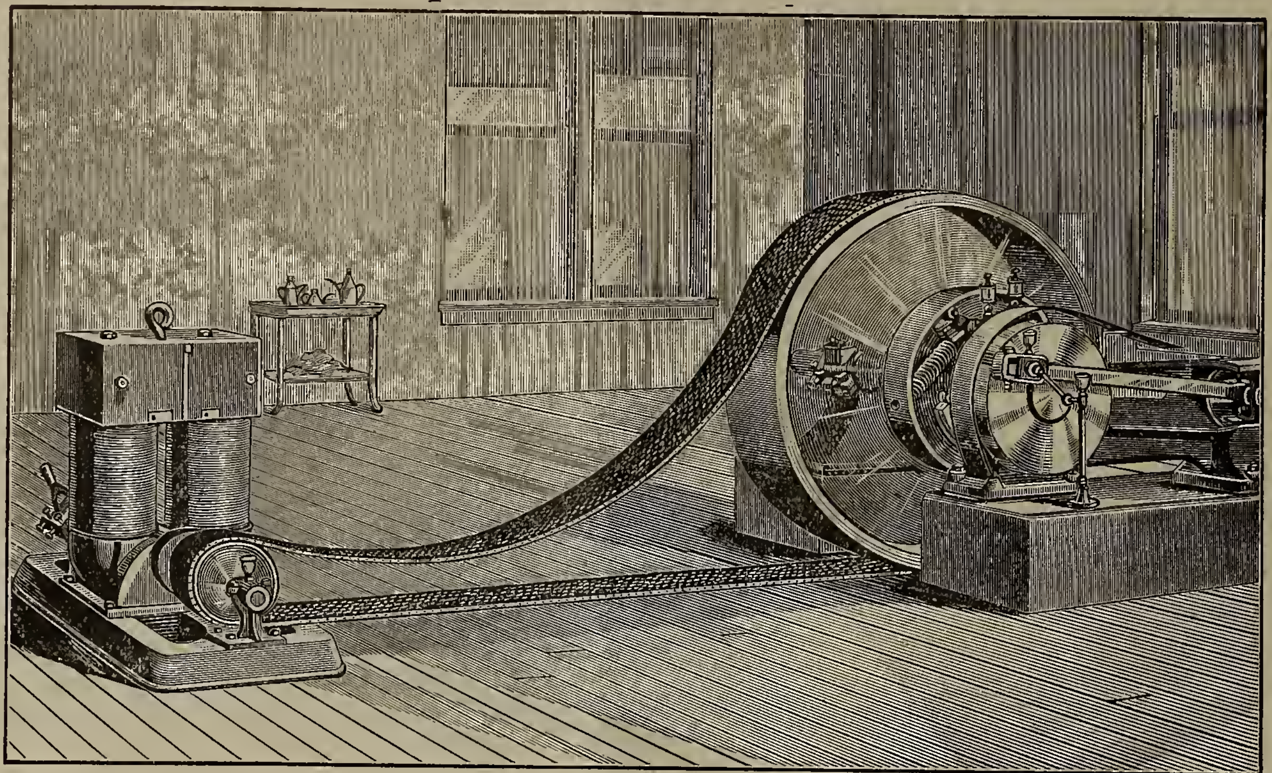
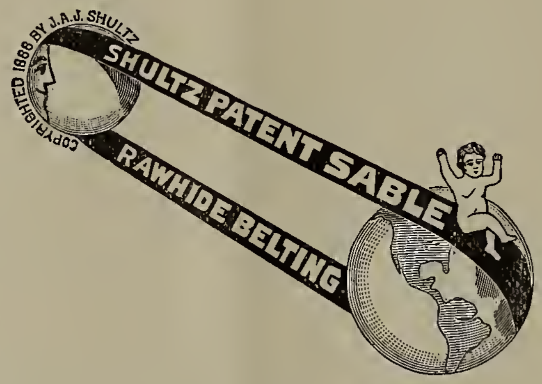


FIG. 6.

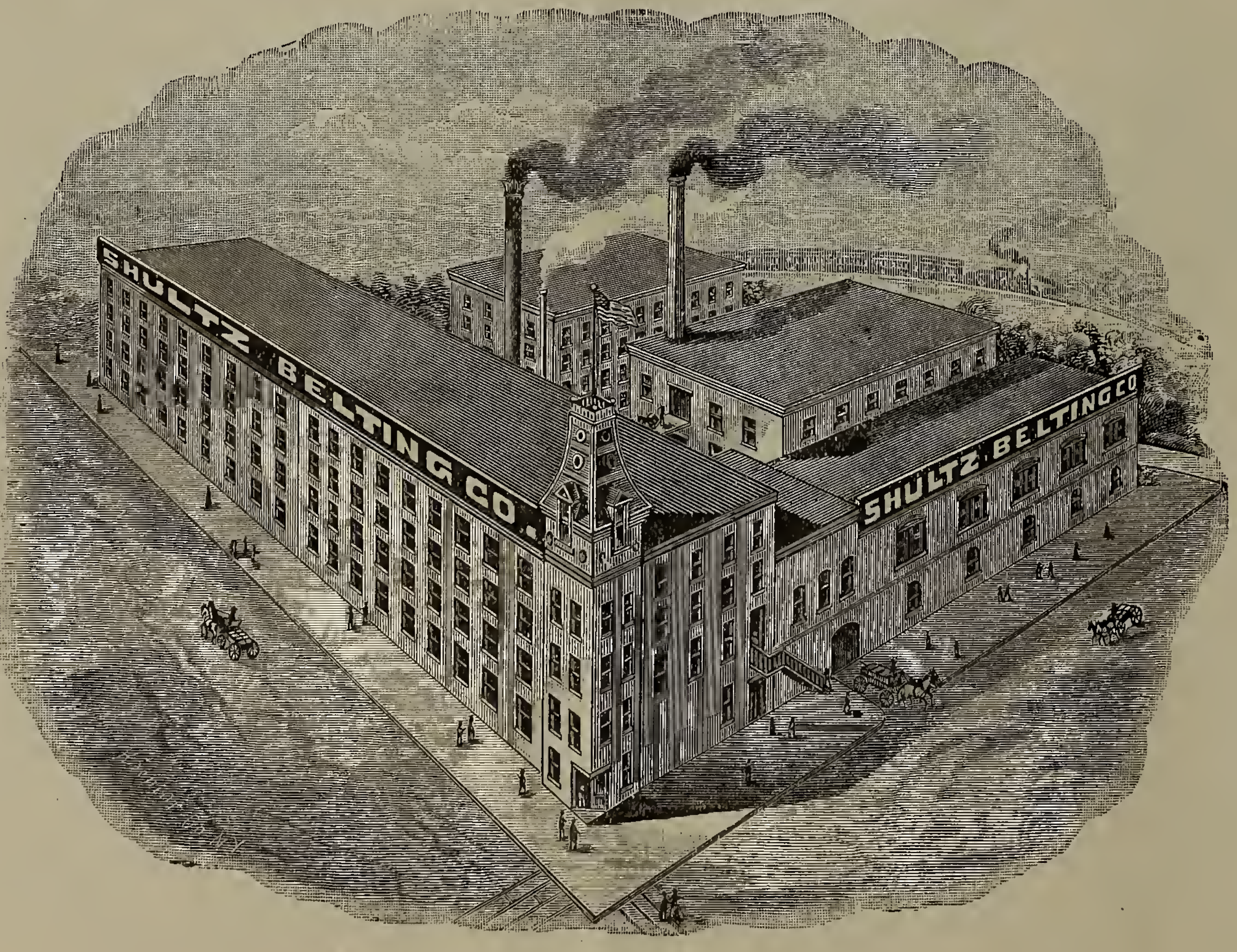
Fig. 4 represents a pulley covered with Shultz's patent leather pulley covering, which saves power and the belts.

The Shultz patent covering being wider than the pulley face, its edges are brought over the edges of the rim and then turned toward each other and fastened on to malleable iron segment clamps, with teeth to hold leather; the clamps are placed around the pulley under the rim, and drawn together by a quarter-inch bolt, which draws the leather tight over the face and edges of the pulley. In this way the leather can be drawn on the face of the pulley as tight as a drum-head, as the process of drawing is in a degree similar, and should the covering ever become loose it can be tightened in a few minutes, simply with a screw-driver to turn the bolts.



The pulley being so perfectly covered, both on face and edges, the belt will wear much longer; besides, a leather-covered pulley will drive fifty per cent. more than an iron-faced pulley; belts can also be run slacker, preventing heated journals and wear and tear on machinery, and the covering will last a lifetime.

One of the most notable users of



FACTORY OF THE SHULTZ BELTING CO.

Sable rawhide belting is the St. Louis and Suburban Railroad Company. The power plant of this company is belted with two 72-inch belts, each 154 feet long; two 34-inch and ten 16-inch generator belts, all of which are made of double Sable rawhide. A view of one of the 72-inch belts in this station is given in Fig. 5. All of the belts above specified have given the railroad company every satisfaction; running noiselessly, straight, smooth, and driving full power. The 72-inch belts develop from 200 to 300 horse-power more than the guarantee of the manufacturer.

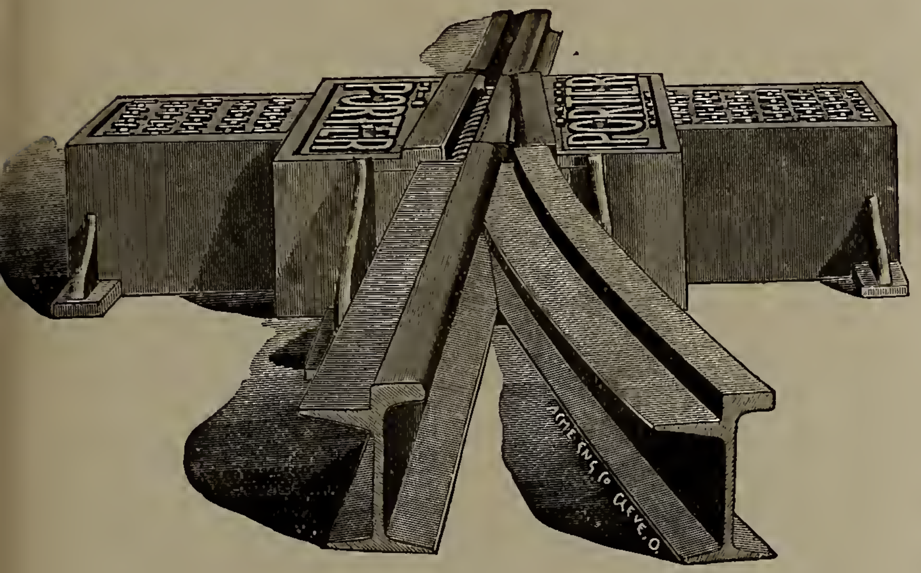

PORTER
PORTER
ACME ENG. Co. CLEVE. O.

FIG. 1.

An example of the application of the Shultz patent woven leather (link) belt is shown in Fig. 6. This view was taken in the plant of the St. Louis Electric Power Company, 210 Lucas avenue, and shows the method of running belts of this class. It will be noticed that the belt is slack on top. In this way more extensive contact between the belt and pulley surfaces is obtained.

Some time ago the Shultz company made two 54-inch Sable rawhide belts to replace oak-tanned leather belts in the Union depot, St. Louis, and is now to make two more of the same width for the same institution.

Four 60 inch belts are now being made by the company for Denver, Col., and it is interesting to note that belts of this company's make are exclusively used in the laboratory of Thomas A. Edison, as well as in the phonograph works, Orange, N. J.

In addition to the agencies in the most important cities in the United States the Shultz Belting Co. is represented in the following-named foreign cities: London, Eng.; Moscow, Russia; Birmingham, Eng.; Havana, Cuba; Brussels, Belgium; Sundsvall, Sweden; and in Japan, India and Australia.

THE PORTER NEW ROCKER SWITCH.

The great trouble with the old-fashioned street-railway switch having a tongue fastened at one end is that it constantly gets filled with dirt, stones and ice, causing untold vexatious delays. The unhandy method of repairing these switches is also a great drawback to their use. When these switches become a little worn the tongue gets loose and often the rear wheels of a car are not tracked with the forward wheels, from the fact that after the forward wheels pass the tongue gets out of position from the vibrations, thereby turning the rear wheels out of the desired course.

To remedy these defects has been the cause of many a new and successful device. The Porter new tramway switch is one of these devices. It is intended for electric, cable and horse railways, though the same principle can be applied to steam railways. The switch is self-acting, and cleans itself of dirt, snow and all obstructions. It is easy to move, and it is claimed that it will not freeze. There is no pivot to get out of order and the tongue cannot get out of the plate or jaw.

Fig. 1 shows the single switch complete and the rails attached. Fig. 2 illustrates the method of construction of the interior mechanism, showing the switch as laid in the pavement on the end of cross-ties, the tread-plate and guide-plates being removed to expose the tongue and shaft on which it rocks.

The tread-rail and tongue are each thirty inches long and are the only wearing parts. The tongue is on a solid base, and when turned to any position lays against either side of the plate from point to heel, thus giving it full support. The switches can be repaired in a few minutes, as all the parts can be replaced without disturbing the pavement around the switch.

It is claimed that the switch will fit, without preparation, any rail or any degree of curve; can be used as a right or left hand switch, on either side of track or on either rail.

This switch is also fitted for cable roads, and with simple attachments for lifting the cable and placing it into the grip.

There is also a simple device by which the track-switch and slot-switch are operated at the same time. This saves the cable from serious accidents caused by the wheels of the cable grip-car taking wild switches, as all the switches are thrown out of track while the car-grip is passing through the grip-slot.

These switches are supplied by the Porter Tramway Switch Company, of 53 Wade Building, Cleveland, Ohio.

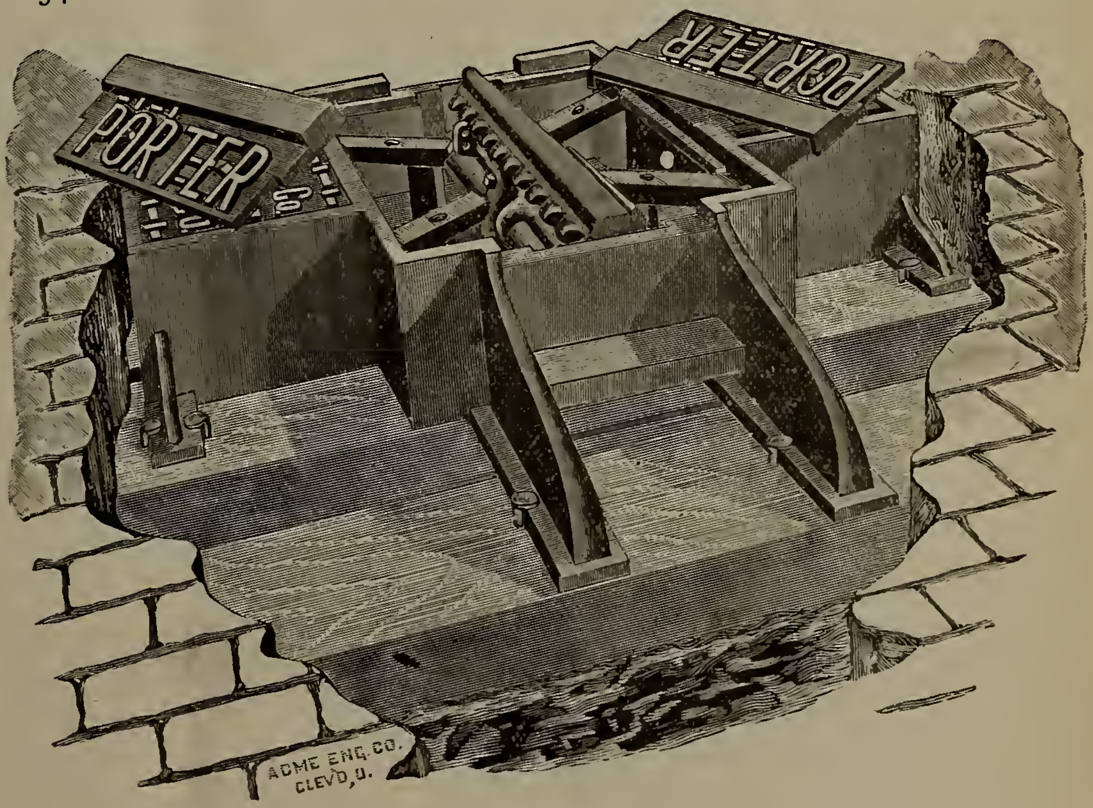
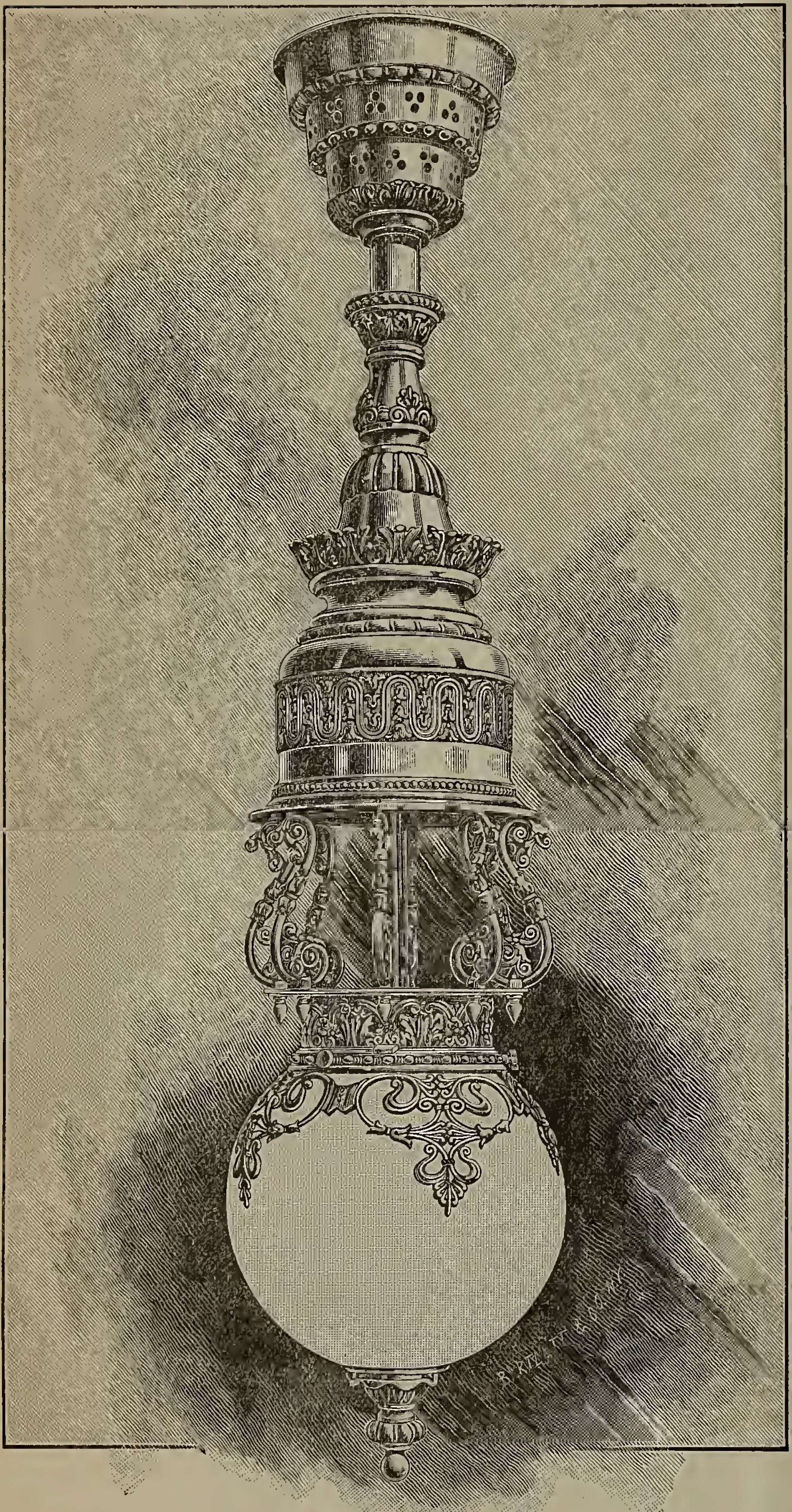

PORTER
PORTER
ACME ENG. CO. CLEV'D, O.

FIG. 2.

Suit for Infringement.—On February 10 Mr. H. T. Paiste, the prominent switch manufacturer of Philadelphia, brought suit against the Hart & Hageman Mfg. Co., of Hartford, Conn., in the United States Circuit Court in the latter city, for damages and injunction to prevent the manufacturing and selling of certain eccentric movement switches which the plaintiff claims to be infringements on his patent of October 4, 1892, No. 483,-862, for his "Xntric" switch movement.

"WARD" ARC LAMPS.

The incandescent lamp has practically been master of the interior electric-lighting field, but it has of late been compelled to surrender a portion of the honors to its near relative—the arc lamp. But an arc lamp to take the place of an incandescent lamp on an incandescent circuit must manifestly be different in construction to the arc lamp used on high-pressure circuits. It must give full candle-power on the low-tension circuit and it must be as steady and reliable in its operation as the incandescent lamp.

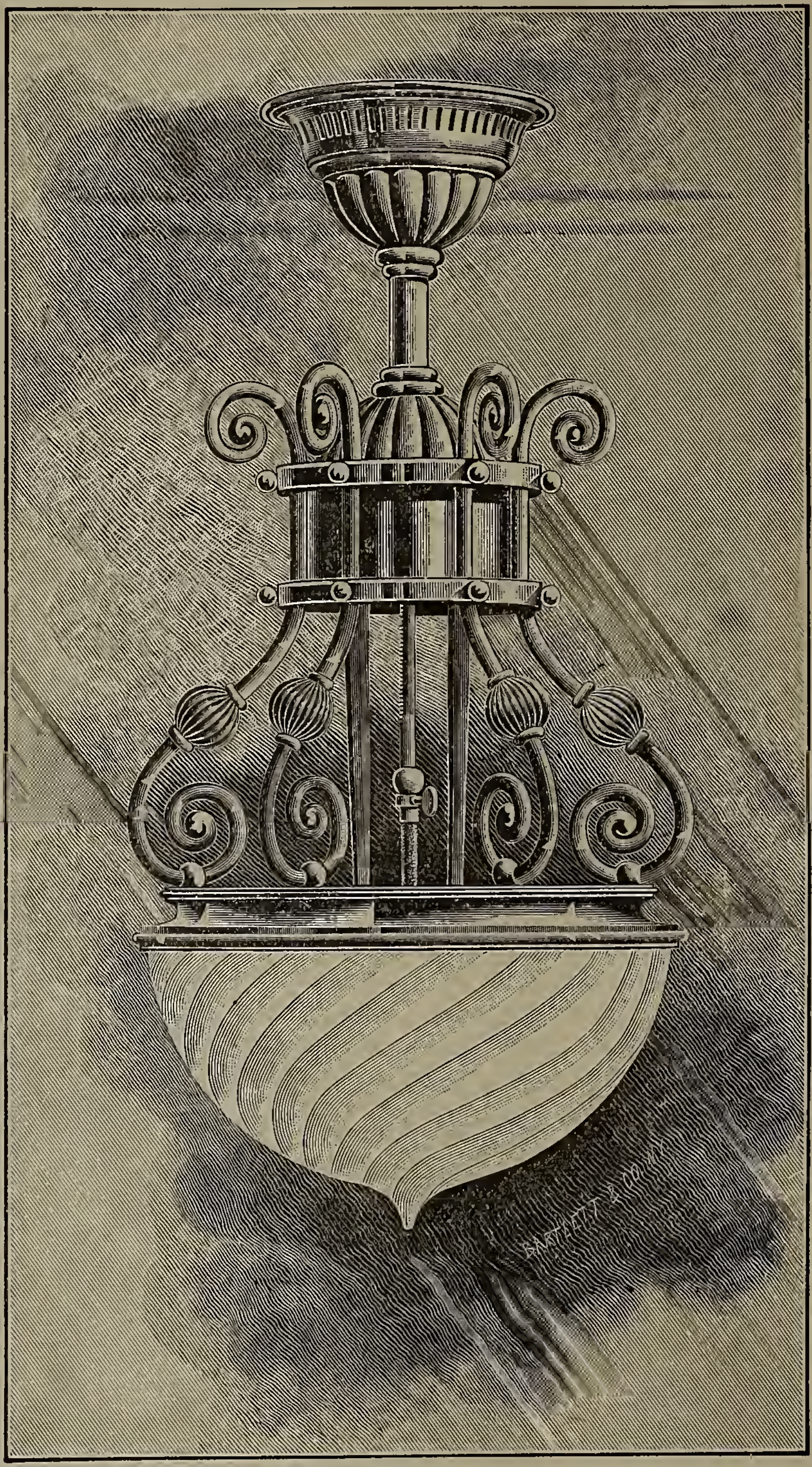


"CORONAL" WARD ARC LAMP.

Such a lamp is the "Ward" arc lamp, which is manufactured by the Electric Construction and Supply Co., of 18 Cortlandt street, New York city. These lamps are made for use on incandescent circuits where large spaces and areas are required to be lighted. They are made in various styles, from the plain lamp to the ornate affairs, an example of which is shown in Fig. 1 of the accompanying illustrations.

Obviously an arc lamp for interior use must give a steady light, and this can only be obtained by a steady flow of current through the arc. This is accomplished in the "Ward" lamp by a principle of combination feed, by which a perfect balance is maintained at the predetermined voltage and ampèrage. The lamps require 45 volts each and will burn in multiple-series in any number, governed only by the range or limit of the voltage of the circuits across which they are placed.

"Ward" arc lamps are made with single and double carbons. The mechanism controlling the feed of the carbons in the double lamp comprises a movement for each pencil, and both are controlled by one set of magnets, or equalizing magnetic system of the same character as that furnished in the single-carbon lamps. The lamps are made in three sizes, to pass 5, 6½, 8 or 10 ampères, and in their operation there is no difficulty in obtaining good results.



SHORT WARD ARC LAMP.

For ornamental interior lighting this company has brought out some designs of lamps that are elegant and rich. Fig. 1 shows the "Coronal," which is one style of the several of these ornamental lamps. Such lamps give a richness of effect in such places as theatres, hotels, halls, churches, etc., that cannot be obtained by any other form of light and fixture. They are made almost entirely from brass castings, and their appearance is rich and imposing.

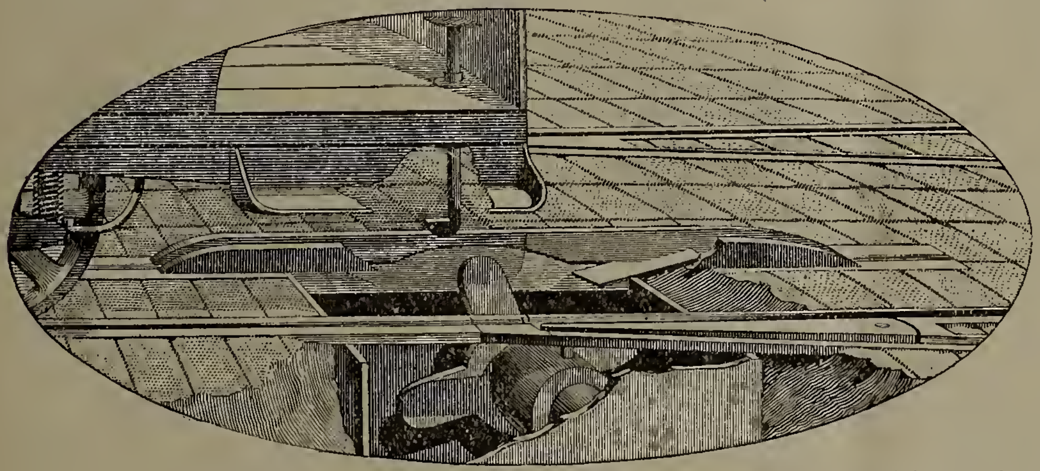
In places where low ceilings exist a short lamp is desirable. Such a lamp is also made by the Electric Construction and Supply Co. Fig. 2 shows an ornamental short lamp. It burns 6½ hours, using a ⅝-inch carbon for the top, and a $\frac{7}{16}$-inch solid carbon at the bottom.

FITCH EXCELSIOR SWITCH.

The accompanying illustration shows the construction of the Fitch Excelsior switch for street railways, which is the latest production in this line. It is claimed to be the cheapest and simplest switch in the market, and, judging from the severe practical tests it has been recently put to, it would seem that the claims were well founded.

By reference to the illustration the operation of this switch may be easily understood. At a point opposite the tongue of the switch and between the two rails are two parallel iron bars forming a channel, in which a rod on the car platform may be depressed by the driver's foot. The lower end of this rod impinges against one of the radial projections of the sleeve on the axle within the box, the forward motion of the car moving the projection about quarter of the way around. This throws the tongue to the opposite side. Two of the projections turn the switch to one side and the other two to the opposite side, the arrangement of the projections corresponding with the right and left positions of the tongue, being alternate—that is, one projection may throw the switch to the right and the next one will throw it to the left; the third to the right and the fourth to the left. As a driver approaches the switch he depresses the pedal if he wishes to reverse the position of the tongue; if it is in the right position he does not need to touch the pedal.

This switch has been tried on the Steinway Railway, Long Island City, N. Y., and Mr. Alfred D. Moulton, the general manager of the company, states that he has given it a thorough and exhaustive trial in all kinds of weather and is perfectly satisfied with its working. He says that it does its work with perfect ease and reliably, and speaks very favorably of it. He corroborates his sentiments by an order for another switch for immediate delivery.



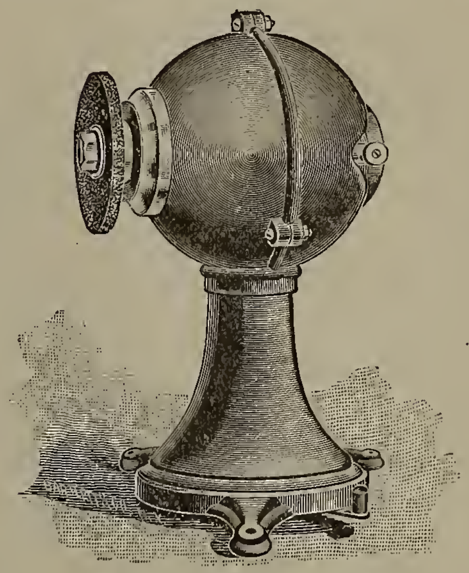
EXCELSIOR SWITCH.

During the trial of the switch on the Steinway road a car was run over it 30 times in succession and every time it acted with perfection.

The Fitch Excelsior Switch Co., 45 Broadway, New York city, is the owner and manufacturer of this simple device. The box, which is placed under the surface of the ground and which contains the mechanism, is only 22 inches x 22 inches x 16 inches in size, and it is said that it is impossible to clog the switch.

ELECTRICAL GRINDER.

The fact that the small as well as the larger sizes of Lundell power-motors, manufactured by the Interior Conduit and Insulation Company, of New York, have been and can be adapted to many useful purposes is again exemplified in the new Bench Emery Grinder which this company has just standardized. The accompanying illustration shows this neat little machine, which will at once commend itself to machinists and others interested in the grinding of small tools, such as twist drills, lathe tools, graving tools, knives, scissors, etc., etc. All shops that have adopted the electric illumination can most conveniently use this device. The emery grinder illustrated is 12 inches high, weighs 18 lbs., and is operated at a speed of 2,500 revolutions maximum, and has in its base a regulating device for two lower speeds. It is of $\frac{1}{6}$ H. P. capacity, 115 volts, and swings a 2-inch emery wheel. Larger and smaller wheels driven by motors of higher or lower powers are also furnished by the Interior Conduit and Insulation Company.



ELECTRICAL GRINDER.

ELECTRICITY ON CANALS.

Senator Endres has introduced a canal improvement bill in the New York legislature. Among other things it is provided that the superintendent of public works be directed to conduct with all reasonable despatch experiments to determine whether electricity can be effectively applied as a motive-power on canals, and to report to the legislature of 1894, for which purpose $10,000 will be appropriated.

BOSTON'S ELECTRIC LIGHTING.

The annual report of the lamp department of the city of Boston, Mass., which has been presented to the mayor, is of interest just at this time, when the subject of the cost of lighting cities is under so much discussion. The report contains the tabulated statements for the year 1892, and relates to electric, gas, oil and naphtha illumination, and the total amount expended for this purpose was $582,113.83. The expense for the electric lighting was $216.444.70. There are 1,547 electric lights. The Boston Electric Light Company furnishes the entire city with illumination, excepting Charlestown, which is lighted by the Charlestown Gas and Electric Light Company, and Brighton, which is lighted by gas.

GALVANOMETER AND BRIDGE.

The voltmeter and ammeter have superseded the galvanometer in practical electric light and power generation simply because they are more convenient instruments to handle, but there is no question that a good galvanometer is yet an indispensable instrument to have besides. It is used for meaurements that cannot be made by the voltmeter or ammeter, especially in experimental and laboratory work; and it is therefore important to have a good instrument to get accurate results.

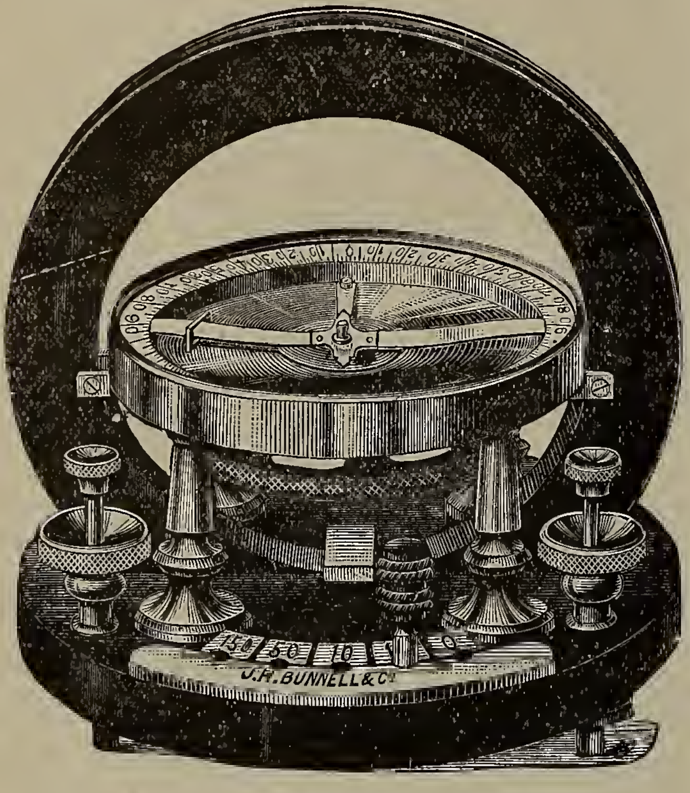

J.H.BUNNELL&Co.

FIG. 1.

The two instruments illustrated herewith are essential in all laboratory work—the tangent galvanometer and Wheatstone bridge. With these two pieces of apparatus a large range of work is possible. The tangent galvanometer (Fig. 1) is wound with 5 coils with resistances of 0, 1, 10, 50 and 100 ohms, each coil being provided with a terminal. The needle, which is ⅞ of an inch in length, is balanced on jewel and point and has an aluminum pointer at right angles to it, extending across the 5-inch dial. One-half of the dial is divided into degrees and the other half into tangents, so that either method of measurement may be used as desired. The needle may be suspended by a silk fibre, and instruments of this construction can be had to order. The ring supporting the coils of wire is 6 inches in diameter and is made of hard rubber, as is also the base of the instrument. Levelling screws are provided, so that perfect level can be secured for the proper operation of the needle.

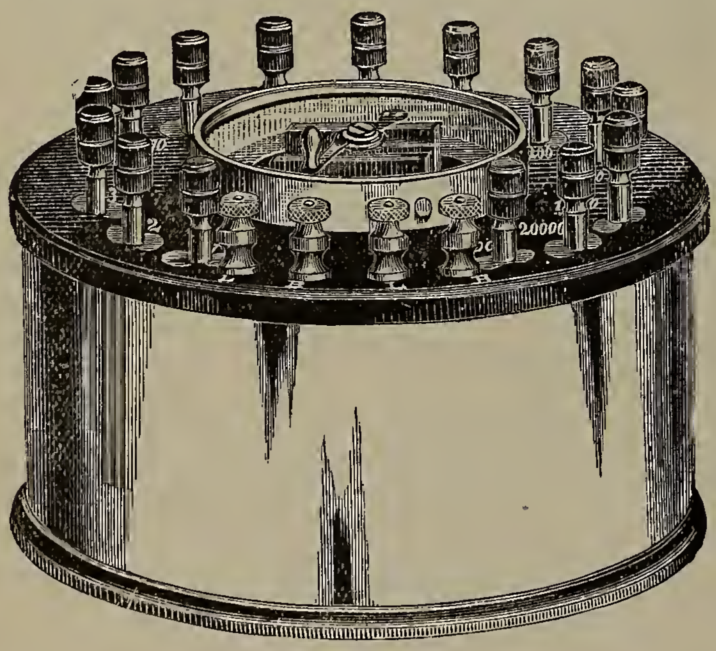


FIG. 2.

The Wheatstone bridge and rheostat combined (shown in Fig. 2) is a very compact arrangement of this important apparatus. It is especially designed for use in connection with the tangent galvanometer just described, and has a range of capacity from $\frac{1}{100}$ to 11,000 ohms. The case is of plated metal and the top is of hard rubber. The discs between which the plugs are inserted are flush with the surface of the hard rubber top, which arrangement prevents undue accumulation of dust and renders it an easy matter to keep the instrument clean. Six wire terminals are provided—two for the testing battery wires, two for the galvanometer, and two for object to be measured. The whole thing is very handy and compact, which are advantages much appreciated by every one using such apparatus.

J. H. Bunnell & Co., 76 Cortlandt street, New York city, are the manufacturers of these instruments, as well as all other kinds of apparatus and devices used in every branch of the electrical industry. This house is well known in the trade and has a high reputation for the quality of its goods.

CONVENTION PROGRAMME.

The following is the official programme of the fifteenth convention of the National Electric Light Association, which will be held in St. Louis, Mo., February 28, March 1 and 2, 1893:

TUESDAY, FEBRUARY 28.

Meeting of the executive committee at 9 A.M., parlor, Southern Hotel.

Morning Session, 10:30 *o'clock*.

BELL TELEPHONE BUILDING.

Address of welcome, Hon. E. A. Noonan, Mayor of St. Louis.
Address, President Jas. I. Ayer.
Report. Committee on data.

Afternoon Session, 2 *o'clock*.

Report. Committee on safe wiring.
Report. Committee on World's Columbian Fair.
Paper. A. D. Adams, "Wrought versus Cast Iron for Field-Magnet Frames."

WEDNESDAY, MARCH 1—*Morning Session*, 10 *a.m.*

Paper. Prof. George Forbes, of London, "Thermal Storage for Central Stations."
Paper. Chas. S. Bradley, "Long-Distance Transmission of Power."
Paper. L. B. Stillwell, "Under what Conditions is the Use of Water-Power Economical?"

Afternoon Session, 2:30 *o'clock*.

Paper. E. A. Armstrong, "Morals of Corporations."
Paper. R. H. Sterling, "Some Experiences with the Alternating System."
Paper. William Brophy, "Relation of Insurance to Electric Lighting and Power."

Evening Session, 8 *o'clock*.

Lecture by Nikola Tesla.

THURSDAY, MARCH 2—*Morning Session*, 10 *o'clock*.

Paper. W. H. Browne, "Underground Conduits and Conductors."
Paper. Calvert Townley, "Incandescent Lamp from a Commercial Standpoint."
Paper. Dr. Louis Bell, "Power Transmission for Central Stations."

Afternoon Session, 2:30 *o'clock.*

Paper. H. C. Myers, " Preservation of Poles and Cross-Arms."

Executive Session.

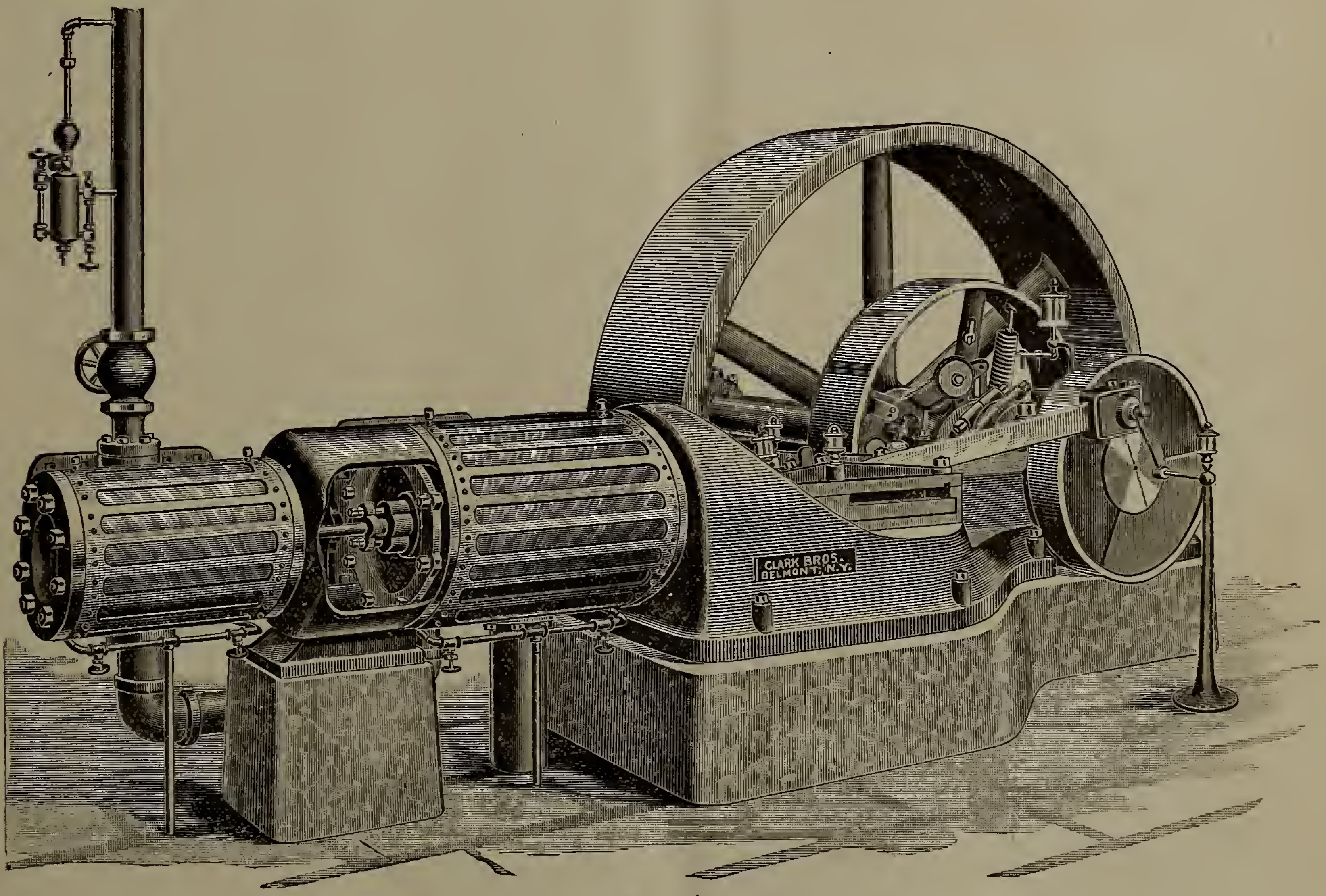
Report. Secretary and treasurer.
Election of Officers.

KEY TO THE BADGES.

At the convention badges of various colors and designs will be worn, each style indicating some particular relationship to the association. The following explanation of the badges will be of interest: president, gold button, red bow; officers, association button (sterling silver), red bow; executive committee, same button, blue bow; honorary members, same button, white ribbon; active members, same button, purple ribbon; associate members, same button, violet ribbon; reception committee, same button, yellow ribbon; guests, olive ribbon.

THE "BELMONT" ENGINE.

The Belmont automatic engine, one type of which is herewith illustrated, presents several notable features. A balanced gridiron slide and cut-off valve, of which only the cut-off valve is under the control of a very sensitive shaft-governor, thus obtaining a speed regulation which depends solely upon the point of cut-off, the exhaust side of the cylinder cycle remaining fixed and positive. By the Clark patent, the valves have a constant travel, thus wearing valve surfaces equally over the whole travel. The governor weights are made up of discs of metal, so that the speed can be changed by altering the quantity of weight; then governor arms also act about knife-edge pivots, instead of a circular pivot, which renders its action absolutely sensitive. There is no friction and no oil is needed. For electric work, the framing and other parts of the engines are built particularly heavy so as to be rigid through the many abrupt changes of load.


CLARK BROS.
BELMONT, N.Y.

THE "BELMONT" ENGINE.

During the winter, Clark Bros. have installed two electric railroad plants, each containing two 200 H. P. engines of this type, and are now building two more. The guarantees given and proven are on Corliss economy of coal, and a regulation not usual to any type of governor. The other types in hand are the centre crank, the side crank self-contained, and the side crank proper, several of which have been installed this winter in smaller electric plants. The New York office of Clark Bros. is at 121 Liberty street, under the management of C. E. Manning, M.E.

OBITUARY.

Mr. George B. Prescott, Jr., died in the Northampton Insane Asylum on February 13. He arrived in New York about three weeks ago from Bermuda, whither he had gone for rest, and on his arrival in New York he became violently insane. Mr. Prescott was a very able electrical engineer and was well and favorable known among the electrical fraternity. He resided in Pittsfield, Mass., and was a member of the American Institute of Electrical Engineers.

Dr. John J. Craven, who superintended the construction of the first telegraph line between New York and Philadelphia, died at Patchogue, L. I., February 14, aged 71 years. Dr. Craven built the New York and Philadelphia line in 1846, and it was he who first conceived the idea of constructing telegraph cables for the purpose of crossing rivers, etc.

THE GENERAL ELECTRIC COMPANY WINS.

Judge Colt in the United States Circuit Court, Boston, on February 18 rendered a decision in the injunction case of the General Electric Company against the Beacon Vacuum Pump and Electrical Company of Boston. The court grants a preliminary injunction against the Beacon company. The Beacon company claimed Edison's patent upon the filament lamp was invalid for want of novelty. This assertion was made upon an allegation that Henry Goebel, a German watchmaker, invented the incandescent lamp in 1854.

It therefore said the Edison patent was for no novel invention, or at least it must be limited to the coil form of filament.

The court says:

"The same line of attack was unsuccessfully made upon the patent in the case of the United States Electrical Company. It was there urged that the Starr lamp of 1845, the Roberts lamp of 1852, the Lodyduine, Konn and other lamps which appeared between 1872 and 1876, the Bouliguine lamp of 1877, the Sawyer-Mann lamp of 1878, and the Edison platinum lamp of 1879 limited the Edison patent to narrow inventions or rendered it void for patentable novelty. But the court, with the most exhaustive review of the prior acts before it, refused to take this view, and held that the claims of the patent, read with the specifications, covered a broad and fundamental invention, namely, an incandescent lamp, composed of a carbon filament, hermetically sealed in a glass chamber, exhausted to a practically perfect vaccum and having leading-in wires of platinum.

"By this invention Edison disclosed to the world for the first time a practical incandescent lamp adapted for domestic uses. Goebel declares that before 1872 he had arrived at a definite conclusion as to the best material for making carbons, and had settled upon bamboo. He had also decided upon platinum as the best leading-in wire, and stove polish as the best material for cementing the joints. He says further that his lamp, No. 4, has been in his possession since before 1872, and that he made and burned it several times before that time. He also employed, previous to 1872, a mercury pump in which no mercury was present in the glass part of the lamp, but he succeeded better in the Torricellian process than with this early mercury pump. He declares he has received no money for his affidavits and has no interest in this suit, and that he has given evidence reluctantly and after considerable urging.

"The defendants produce some 40 affidavits in confirmation of the statement of Goebel in respect to the statement of his lamp; of these witnesses five are his children, one his niece, and the remaining all friends or acquaintances. So far as appears these people are all respectable and truthful. They testified generally to seeing the Goebel lamp in his shop and on his wagon at various times between 1850 and 1882. Some declare the light was good, but do not state the length of time the lamp would burn. Generally speaking, the testimony is confined to the old fiddle-bow lamp and relates to a period prior to or about 1860.

"In further support of the Goebel anticipation several experts give affidavits to the effect that the Goebel lamp, assuming that it was made prior to 1879, contains the broad invention covered by the second claim of the Edison patent, as it embodies the same combination of a carbon filament with an all-glass exhausted receiver and conductors passing through the glass.

"There was filed at the same time with the foregoing supplemental affidavits other affidavits of persons who knew Goebel and saw his lamp. The light from the Goebel lamp seems to grow brighter and more steady as the affidavits multiply.

"William C. Dreyer states that he undertook to form a company to purchase from Henry Goebel his inventions and patents, and that in 1882 he did procure from him an option for three months of all his inventions relating to electric lighting upon payment to him of $500, and an extension of the option for another three months for which an additional $425 was paid. Goebel was also to have a large compensation from the company if it was formed. At that time Goebel said that he had made some small incandescent lamps called the fiddle-bow. It was considered of great importance to have one of these lamps, and he made every effort to find one, but never succeeded.

"Albert Hetchsell, a manufacturer of thermometers and scientific apparatus, states that in 1881 he was in the employ of the American Electric Light Company, and was directed to work with and help Henry Goebel, and was at his shop for several months. Hetchsell describes how Goebel in a crude way made three or four little incandescent lamps with the use of a poor vacuum pump; that he was unable to make a successful lamp, and he is certain that if he had possessed one at that time he would have exhibited it.

"William McMahon in 1888 was interested in starting a company to compete with the Edison lamp. Goebel showed him an arc lamp, but said that he had never made an incandescent one. There was intense excitement at this time over the Edison incandescent lamp. Everybody recognized that Edison had made the invention. There was every reason at that time why Goebel and his son should disclose what they had done in this direction. If any one had preceded Edison in his invention, unlimited capital could have been secured for an opposition company. For these reasons he (McMahon) is satisfied that Goebel never made an incandescent lamp prior to March, 1881."

The court says further:

"Upon consideration of the whole of the evidence upon this motion, I have reached the following conclusion:

"It is extremely improbable that Henry Goebel constructed a practical incandescent lamp in 1854. This is manifest from the history of the art for the past 50 years, the electrical laws which since that time have been discovered as applicable to the incandescent lamp, the imperfect means which then existed for obtaining a vacuum, the high degree of skill necessary for a construction of all its parts, and the crude implements with which Goebel worked.

"Whether Goebel made the fiddle-bow lamps one, two and three it is not necessary to determine. The weight of evidence on this motion is in the direction that he made those lamps similar in general appearance, though it is manifest that few, if any, of the many witnesses who saw the Goebel lamps could form an accurate judgment of the size of the filament or burner. But assuming they were made, they do not anticipate the invention of Edison. At most they were experimental toys used to advertise his telescope or to flash a light upon his clock or to attract customers to his shop. They were crudely constructed and their life was brief. They could not be used for domestic purposes. They were in no practical sense the lamp of Edison.

"As for lamp No. 4, I cannot but view it with suspicion. The reason given for not introducing it before the hearing is not satisfactory. The lamp to my mind envelops with a cloud of distrust the Goebel story. It is simply impossible, under the circumstances, to believe that a lamp so constructed could have been made by Goebel prior to 1872. Nothing in the evidence warrants such a supposition, and other things go to show it untrue.

"It has often been laid down that a meritorious invention is not to be defeated by something that rests upon speculation or experiment, or which is rudimentary or incomplete. The law requires not conjecture but certainty. It is easy after an important invention has gone into public use for persons to come forward with claims that they invented the same things years before, and to endeavor to establish this by the recollection of witnesses of events long past. Such evidence is to be received with great caution and the presumption of novelty arising from the grant of the patent is not to be overcome except upon the most clear and convincing proof.

"Owing to the large interest involved, I have carefully considered this motion, and I am satisfied upon the evidence and the law applicable thereto, that it should be granted."

Messrs. Fish, Richardson & Storrow, of Boston, and C. A. Seward and R. W. Dyer, of New York, represented the General Electric Company, and Witter & Kenyon, of New York, and L. D. Brandies, of Boston, the Beacon company

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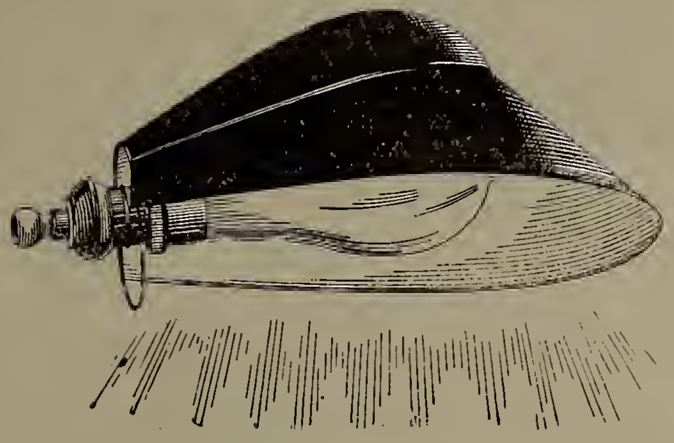
A PETITION is being circulated in Whitinsville, Mass., which will be presented to the selectmen, to compel the Uxbridge and Northbridge Electric Company to remove all guy-wires attached to its poles.

THE annual report of the Edison Electric Illuminating Company, of Boston, Mass., for the year ending December 31, 1892, shows, gross income $524,263; net earnings $237,255.

THE E. P. GLEASON MFG. CO.

Among the new goods that are being prepared for the spring trade, some designs and devices by the E. P. Gleason Mfg. Co., of New York city, deserve special mention. We illustrate four, the utility and usefulness of which will be appreciated by toilers in the electrical field, who have experienced the annoyance and irritation of endeavors to meet the requirements of special emergencies.



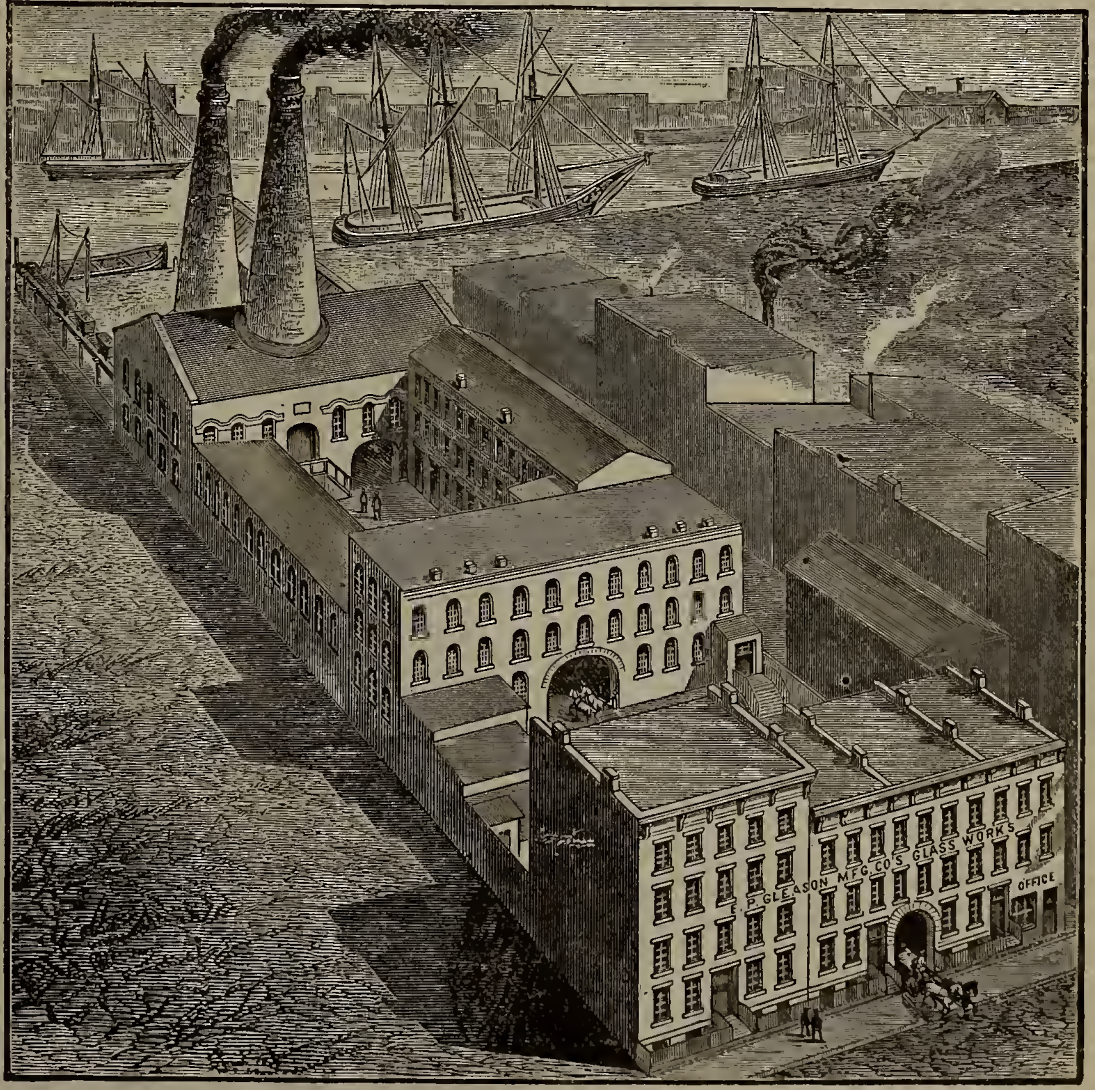
HALF SHADE WITH FLARING CURTAIN.

The difficulty of giving satisfaction in the illumination of billiard-tables and bowling alleys is proverbial among those who do this class of work. To them the enamelled half shade with the flaring curtain, which we show, will prove a source of satisfaction. It has been adopted by many of the leading hotels of New York, and has been welcomed by those captious critics of the lighting arrangements—the billiard-players.

The "Standard Reflecting Pendant" is a step in the right direction. At present many stores and public places are lighted by reflectors made of so many different sizes of material and fittings that it is almost an impossibility to duplicate any of the parts without having them made to order.

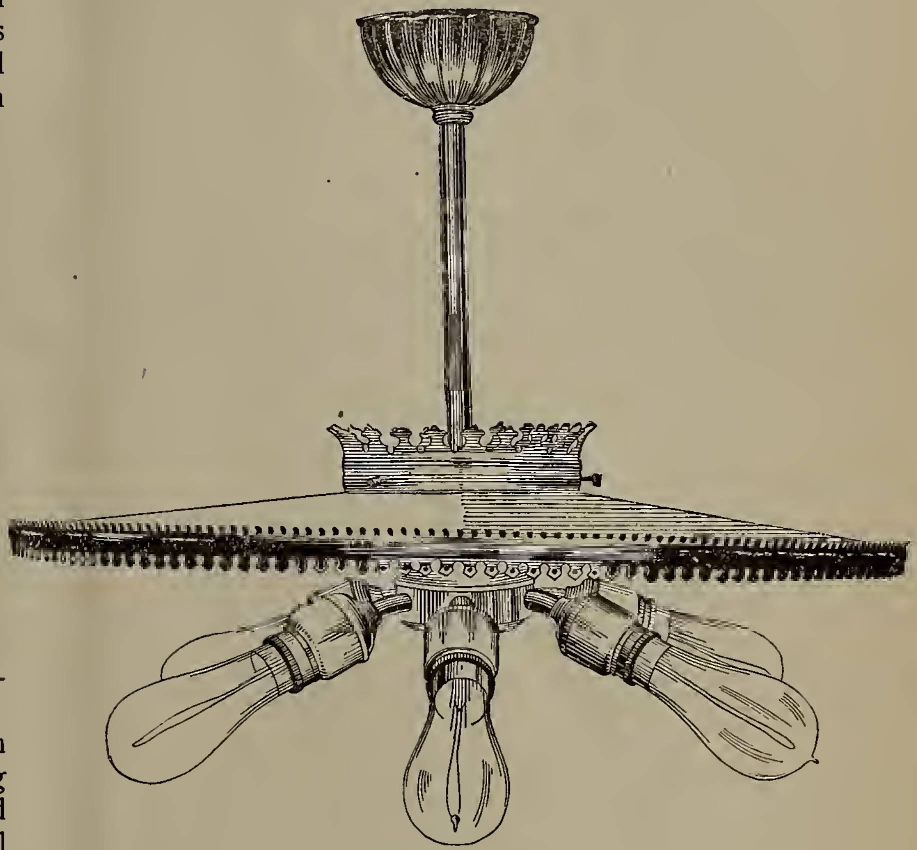
A very pretty article, and one destined to almost universal use, is the stalactite globe, covered with a metal cuirass. These cuirasses are finished in any color, and for inexpensive but artistic lighting will find much favor with the public.

STALACTITE GLOBE.


E. P. GLEASON MFG. CO'S GLASS WORKS
OFFICE

WORKS OF THE E. P. GLEASON MFG. CO.

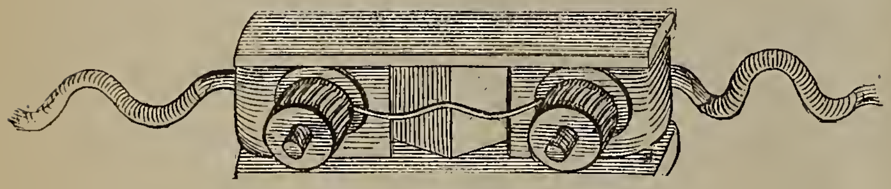
Perhaps none of the designs just spoken of will meet with anything like the hearty approbation which construction and wire men will accord to the new "cut-out bugs," for which a patent has been asked. Only those who with clumsy fingers have endeavored to adjust a fuse in a small cut-out can appreciate the decided advantage which this device possesses. As the illustration shows, the main wires are secured on one side of the bug and the fuse positioned on the other. In fusing there are



STANDARD REFLECTING PENDANT.

no refractory copper wire ends to deal with; it being necessary only to back the milled nut, which fastens the fuse wire, insert the fuse and tighten the nuts. No screw-driver or other tool is necessary. Much exasperation to the workman and much valuable time for the employer will be saved by them. We can assure the E. P. Gleason Mfg. Co. that many electrical workers will appreciate their energy and enterprise.

The company's glass-works in Brooklyn are also producing some decided novelties in shapes, colors and finishing of the great variety of glassware required to trim or make the lamps and sockets ornamental.



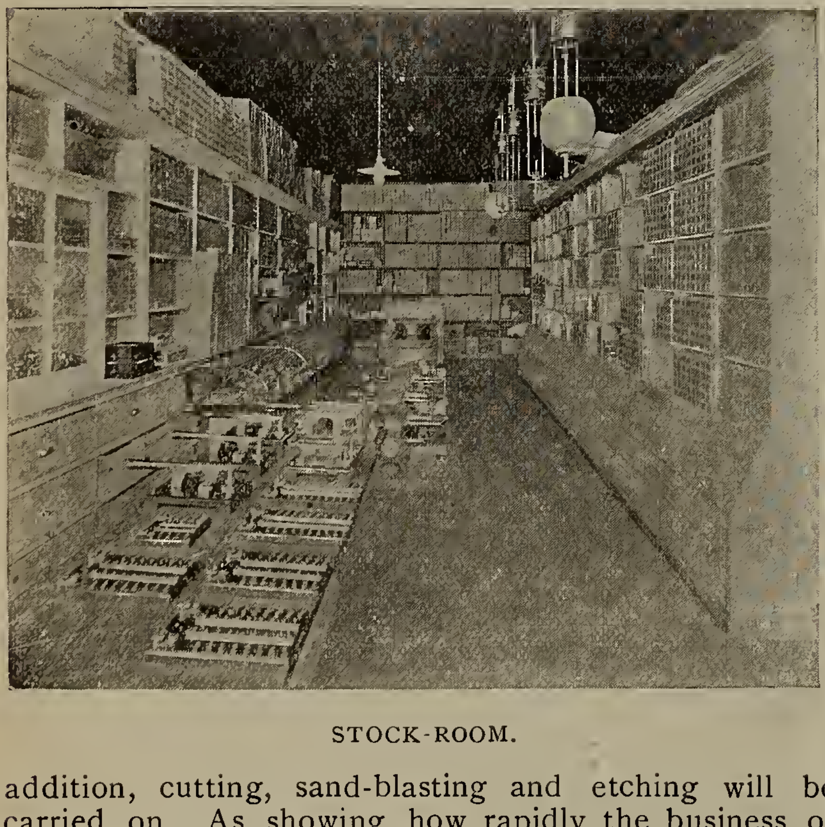
CUT-OUT BUG.

The glass-works of this company, illustrated herewith, have a frontage of 100 feet on Commercial street and a depth of 503 feet.

This company, whose offices and warerooms are at 181–189 Mercer street, New York city, was organized in 1871, up to which time Mr. Gleason had been running the business alone since 1851.

This company is well known in the electrical trade as one of the foremost in the manufacture of electrical appliances and glassware for arc and incandescent lighting. Among the specialties it manufactures are holders, insulated joints, cut-outs, etc., and among its glassware, the shades and stalactites cannot be surpassed for beauty of design and finish.

The company is now enlarging its glass-works by the addition of a four-story building, in which glassware will be finished as it comes from the works. In the new addition, cutting, sand-blasting and etching will be carried on. As showing how rapidly the business of manufacturing glassware has grown, it is interesting to note that when the glass-works were opened in 1883, they consisted of two buildings; now no less than eight buildings are included in the works, not counting the new additional building just referred to.

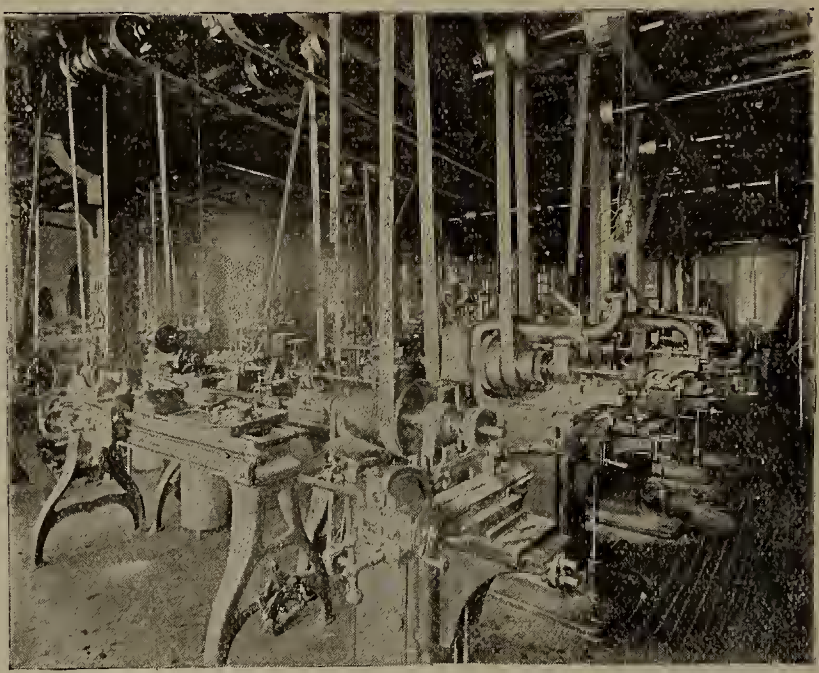


STOCK-ROOM.

In the works the company has 18 pots for melting glass, and in addition to these it has hired the Ravenswood (L. I.) Glass Works, which has 6 pots, making 24 pots in all. The company has, besides these, a number of annealing furnaces in constant operation.

The store and sales-rooms are on the first and second floors of the building on Mercer street, which is occupied by the company. The other four floors and the two buildings adjoining are used for the manufacture of the various electrical appliances.

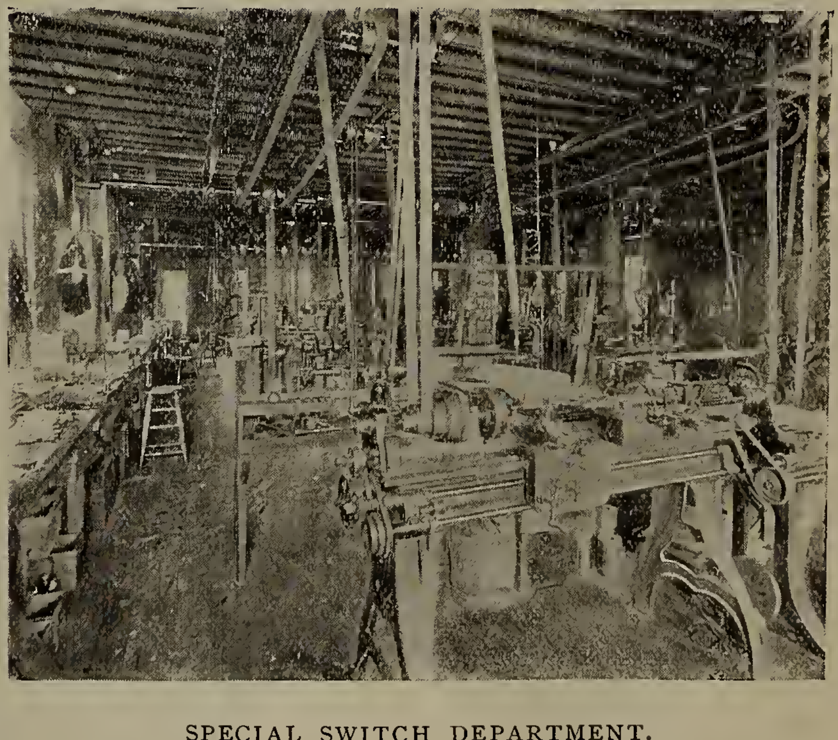
The company has a large foundry at Seneca Falls, N. Y., where all the iron castings are made. At this foundry the company also makes a large line of ornamental lamp-posts for halls, stores, theatres, etc., also ornamental iron goods of every description required in the various branches of the electrical business.



MAIN MACHINERY FLOOR.

ELECTRIC ENGINEERING AND SUPPLY CO.

The Electric Engineering and Supply Co., of Syracuse, N. Y., is a corporation established in 1890. Its early history bears evidence of an exceedingly modest beginning, and during the two years of its existence has become an enterprise of world-wide renown, and the E. E. & S. specialties are sought after in foreign as well as in the home market.



SPECIAL SWITCH DEPARTMENT.

The manufacturing plant is situated at Syracuse, N. Y., and is the most complete of its kind in every detail. It is thoroughly equipped with the latest improved machinery in its several departments. The machine-shop, laboratory, brass foundry, assembling and inspecting rooms, pattern and wood-working department, testing and repair rooms afford unsurpassed facilities for the manufacture of electric lighting and street railway supplies, and is said to be the largest concern in the United States manufacturing a full line of electrical specialties. Particular attention is given to the quality of porcelain insulators, and this company was the first to use porcelain in the manufacture of sockets, as by its use the insulating parts consist entirely of air spaces and a peculiar quality of porcelain, so tough that the brass parts are riveted to it without breaking it. Also the old-time rubber key has now been supplanted by one made of porcelain. To this and the superior workmanship of all its products the established popularity of the "E. E. & S." sockets, switches, rosettes, main and branch blocks, etc., is due, and the demand for its goods is daily increasing in the markets of England, France, Germany, Mexico, Central and South America and all the British provinces.

ASSEMBLING DEPARTMENT.

In the repair department special care is given to the repairing of all kinds of machinery used in arc or incandescent lighting, rewinding of armatures of any style or type, and a corps of experienced and efficient winders are employed.

Through the ever-increasing and almost imperative demands of the company's many patrons and of the electrical trade in general it has created a special department for the manufacture and construction of all kinds of station switches, panel boards, switch and arc plug-boards. The station switches are of the jack-knife order, ranging from a 25 amp. motor switch to a 1,000 amp. central-station switch, single, double and triple pole, single and double throw. All the switches of this class that were used in the installation of the World's Fair buildings came from this department, together with a number of other articles specially designed by this company. The most elaborate and extensive switchboards for central-station use have been constructed in this department. Great care is exercised in procuring slate containing the best dielectric qualities. With a highly polished surface and brasswork neatly buffed and lacquered, and mounted with the E. E. & S. Co.'s instruments, these boards present a very handsome appearance.

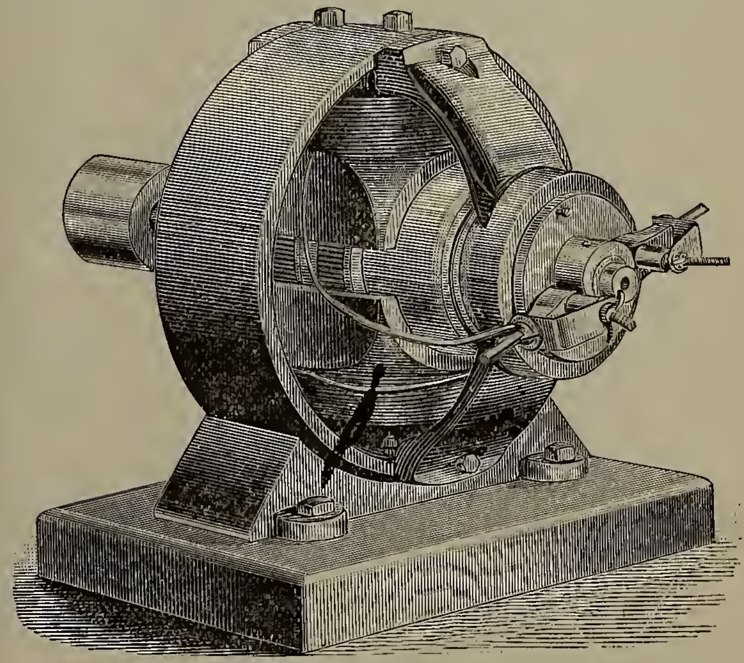
A handsomely illustrated catalogue has just been issued, containing illustrations of all the articles manufactured with the exception of a few of its latest productions.

Its main offices are located at 308 and 310 W. Jefferson st., Syracuse, N. Y.; warehouse at 215 Walton st.; with a branch office at 126 Liberty st., New York, of which Mr. F. C. Timpson is manager, and agencies at Chicago, St. Paul, St. Louis, Washington, Denver, San Francisco, Victoria, B. C.; Montreal, Canada; London, England; and Paris, France. The officers of the company are H. C. Hodgkins, president; J. L. Hinds, vice-president and superintendent; C. T. Moffett, secretary and treasurer; H. J. Gorke, manager.

The accompanying illustrations give views of several of the departments of this company, from which some conception of the extent of the business may be obtained.

SAFETY DYNAMO.

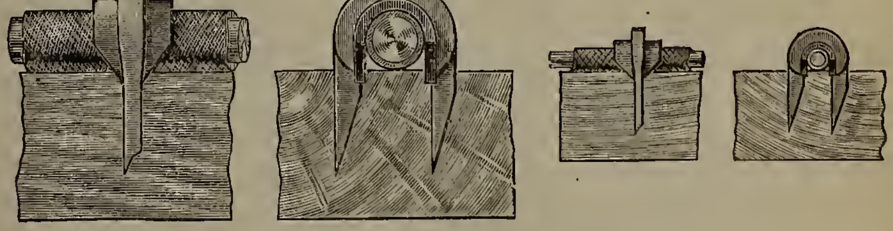
This new "safety dynamo" is of the latest improved model, built on the best mechanical principles; very compact, and is in very many respects said to be far superior to any other now on the market. It requires very little attention, and when once adjusted the brush-holder need not be moved until the brushes are consumed. The current is very steady, and the E.M.F. practically constant in this dynamo, which, together with the simplicity of the machine, makes it about perfect. The cost is less than any other first-class dynamo in the market capable of doing the same amount of work. 1 H. P. dynamos are wound for any voltage up to 500. These machines are made by the Wright Universal Electric Co., 26 Whitehall street, New York city.



SAFETY DYNAMO.

VULCANIZED FIBRE.

Vulcanized fibre is a material with which all electrical people are familiar on account of its very extensive use in the electrical industries as an insulating material. It is an excellent substitute for hard rubber, and as such it is largely used by the principal electric light companies and manufacturers of electrical instruments in the United States and Europe. Its insulating properties have stood the test of time, and it possesses the excellent feature of improving with age. It is made in three colors, viz.: red, gray and black, and it will receive a fine polish. It is used in dynamos for commutators, field-magnet heads, etc., for switchboards and switch-plugs, wall insulators, bases of electrical and telegraph instruments, press buttons, electrical gas-lighting apparatus, electric fire and burglar alarms, electric lamps, and a variety of purposes.



INSULATING SADDLE STAPLES.

In the insulating saddle staple, an illustration of which is shown herewith, this material is put to a valuable use. The "saddle" is composed of vulcanized fibre firmly attached to the staple, and on account of its large surface and insulating properties electric wires fastened with them are in no danger whatever of causing trouble by leakage at the points where they are thus secured. The National Board of Underwriters requires that staples of this character be used in interior electric-light wiring.

Vulcanized fibre is very tough and can be worked in the lathe. It can be tapped, drilled and screw-threaded. It is usually furnished in strips 8 inches wide by 40 inches long, and tubes are also made from it.

The Vulcanized Fibre Co., 14 Dey street, New York, is the sole manufacturer of this material.

WESTON ELECTRICAL INSTRUMENT COMPANY.

Attention is called to the advertisement of the Weston Electrical Instrument Company, Newark, N. J., in this issue. It contains a great deal of valuable information regarding the celebrated Weston voltmeters and ammeters, with the latest improvements made in their construction, and will be found interesting reading. The Weston Electrical Instrument Company is as usual full of business, and would find it difficult to keep up with the demand for its well-known goods did not the equipment of the Newark works afford exceptional manufacturing facilities.

NOTES OF GENERAL INTEREST.

The English patent of the Crossley Telephone Transmitter expired on February 1.

The government of Belgium has formally taken over the telephonic system of that country.

The National Electric Development Company, of San Francisco, Cal., has gone out of business.

The sheriff seized the property of the Erie City Car Works, of Erie, Pa., on judgments of $92,000, in favor of the First National Bank of Erie, and $8,000 in favor of the Second National Bank. Several hundred men are thrown out of employment by the closing of these works.

Exhibit at the Convention.—The Electric Selector and Signal Company, of New York city, which has succeeded the Electric Secret Service Company, will have an exhibit at the St. Louis Convention that should be peculiarly interesting to all electric-light men. This exhibit will consist of the company's system of selective arc-light and motor cut-outs. Some new devices have lately been added to the system which materially simplify the operation of the cut-outs; these will be shown for the first time to the electrical profession at the convention. The company will be represented at St. Louis by Messrs. C. P. MacKie, Robb MacKie, S. S. Bogart and Herbert Laws Webb.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, February 18, 1893.

Mr. W. J. C. Putnam Cramer, of the Blair Lamp Adjuster Co., Blair, Neb., was in the city last week.

Capt. Willard L. Candee, of the Okonite Company, and Prof. George Forbes, of London, were passengers on the steamer City of New York, which arrived from Liverpool last week.

Mr. Bradley, of the Crocker-Wheeler Electric Co., has just returned from an Eastern trip and reports excellent success in sales of Crocker-Wheeler motors and other new appliances.

The Edison Electric Illuminating Company of Brooklyn, N. Y., proposes to increase its capital stock from $1,500,000 to $2,500,000. The vote of the stockholders is to be taken on March 8.

The Beverly and Edgewater Park (N. J.) Electric Light Company has bought a 650-light Fort Wayne alternator, through H. C. Adams, Jr., 44 Broad street, agent for the Fort Wayne Electric Co.

Huebel & Manger, 286 to 290 Graham street, Brooklyn, N. Y., are rushing things in the bell trade. Their electric bells are well known for excellence of manufacture and finish and reliability. They embody several improvements that are not found in other bells, and they are first-class in every respect.

Mr. W. A. Vail has succeeded the firm of Truex & Vail and will continue the manufacture of the swinging ball lighting arrester, which is so extensively used in electric light and power plants throughout the country. The arresters insure absolute protection for both line and station apparatus. Mr. Vail continues at the old stand, 136 Liberty street.

The Clark Electric Co., 192 Broadway, has just issued a very neat catalogue of its ornamental arc-lamp. The various other lamps and apparatus pertaining to the company's electric-light system are also described. The ornamental lamp can be used on any current—high-tension arc or low-tension incandescent and alternating currents.

The De Mott Motor Co., 173 Greenwich street, is meeting with much success with its improved electric motors. This motor is said to do more work with the same amount of current than any other motor on the market. They are designed to run mechanical toys, model-machinery, turn-tables, and for ventilating. The largest size will operate dental outfits, a small lathe or a sewing-machine.

C. S. Merrill, who has for the past four years been representing the Underwood Mfg. Co., of Tolland, Conn., manufacturers of the well-known cotton belting, has opened a salesroom at 38 Cortlandt street. Mr. Merrill will carry a full line of the Underwood company's goods. Its specialties consist of cotton and leather belting, and Mr. Merrill's stock will also include pulley covering. He will be glad to see his friends at his new address.

The Standard Paint Co., No. 2 Liberty street, has gotten out a very handsome and unique card. It consists of a thin slab of porcelain, on which is painted in different-colored bronze letters an advertisement of the company's business. In the centre is the company's well-known trade-mark. The Standard Paint Co. is especially well known in the electrical trade through its preservative paints for iron and wood work. They are both acid and water proof, and the insulating armature varnish and insulating papers are very extensively used on electrical apparatus. This company's wide reputation is based solely on the merits of the goods it deals in, and not upon any unsubstantiated claims.

The Wright Universal Electric Company, of this city, was highly honored by the late American Institute Fair, receiving, it is said, the highest award over every other exhibitor for medical batteries (primary)—the medal of silver, or special medal, and medal of superiority for electrical exhibit. This was said to be the most unique exhibition of primary batteries, etc., ever held at this institution. Some interesting devices, such as coach-lamps, banquet-lamps, hand-lanterns, table-lamps and bicycle batteries and lamps were shown. The sporting-goods people have taken a great hold on this company, and are keeping them busy day and night turning out the bicycle outfits. W. T. H.

ELECTRICAL STOCK QUOTATIONS.

The following are the latest prices for electrical securities in New York, as quoted by Geo. B. Ellery, financial editor ELECTRICAL AGE.

NAMES OF COMPANIES.	CAPITAL.	PAR.	PRICE.
American Dist. Tel., N. Y.	3,825,000	100 00	58 00
American Telegraph and Cable	14,000,000	100 00	92 75
American Visual Telegraph Co.	500,000	100 00	†75 00
Bell Telephone	17,000,000	100 00	203 00
Bell Telephone 7s	2,000,000		*113
Boston Electric Light Co	1,500,000	100 00	117 00
Brooklyn Edison Electric Light	1,500,000	100 00	120 00
Brooklyn Edison Electric Light, 5s	500 000		*100
Brooklyn Citizens' Electric Light	500,000	100 00	166 00
Brooklyn Municipal Light	500,000	10 00	17 50
Brooklyn Traction Co., N. Y.	6,000,000	100 00	31 50
Brooklyn Traction Co., Pref.	3,000,000	100 00	100 00
Brush Elec. Lt. Co. pref., Balto	600,000	100 00	80 00
Brush Elec. Lt. Co., Balto., 5s	200,000		*105
Brush Elec. Ill., N. Y.	1,000,000	100 00	30 00
Brush Elec. Ill., 6s, N. Y.	300,000	100 00	*1 02
Brush Elec. Co., Parent		50 00	40 00
Brush-Swan E. L. Co. of N. E.	2,000,000	100 00	20 00
Burrell Electric Signal Co., N. Y.	500,000	20 00	10 00
Chattanooga Elec. Lt. Co., Tenn., 6s.	200,000		*101
Chattanooga Elec. Lt. Co., Tenn.	100,000	100 00	92 75
Chicago Gas	25,000,000	100 00	90 00
Columbia Chronophone Co., Phila.	500,000	25 00	35 00
Commercial Cable Co	7,716,000	100 00	185 00
Cons. Gas Co., N. Y.	35,430,000	100 00	134 50
Cons. Subway Co., N. Y.	3,000,000	100 00	25 00
Detroit Elec. Lt. & P. Co	300,000	25 00	14 00
Detroit Elec. Lt. & P. Co. 6s.	300,000		*101
Detroit Electrical Works	1,000,000	10 00	4 50
Direct U. S. Cable Co., Ltd	6,400,000	100 00	50 00
Edison Elec. Ill. 5s, N. Y.	3,250,000		126
Edison Elec. Ill., Lebanon, Pa	80,000	10 00	13 75
Edison Elec. Illuminating, N. Y.	6,500,000	100 00	126 00
Edison Electric Light Co., Phil	2,000,000	100 00	105 00
Electric Protection Co., N. Y.	100,000	100 00	75 00
Elec. Sup. & Con. Co., N. Y.	120,000	15 00	16 00
Electrical Forging Co	2,000,000	100 00	85 00
Elmira Municip. Imp. Co., 5s.	1,800,000		par
Erie Telephone	4,800,000	100 00	50 00
Fort Wayne Elec. Co	4,000,000	25 00	13 00
Franklin Electric Co., N. Y.	5,000,000	100 00	†83 00
Fremont E. L. & P. & Gas Co., O.	95,000	100 00	102 50
General Electric Co.	50,000,000	100 00	110 50
General Electric Co., 5s	7,931,000	10 00	*100
General Electric pret	4,223,700	100 00	116 00
Great West. Elec. Sup. Co. pref. 8s.	350,000	10 00	10 00
Guarantee Identification Co., N. Y.	50,000	50 00	40 00
Hickory Electric Co., N. C.	12,000	100 00	112 00
Interior Conduit & Ins. Co., N. Y.	1,250,000	100 00	75 00
Int. Okonite, Limited	1,700,000	50 00	49 00
Laclede Gas Co	7,500,000	100 00	24 00
Laclede Gas pref.	2,500,000	100 00	74 50
Laclede Gas 5s.	10,000,000		85
Law Telephone	400,000	100 00	96 00
Livingston E. Lt. Co., Mont., 6s.	30,000		*92
Marshalltown Elec. Co. 6s, Iowa	65,000		*98
Marysville L. & W. Co. 6s, Ohio	60.000		*98
Metropolitan Elec. Signal Co., N. Y.	1,500,000	100 00	35 00
Metropolitan T. & T., 5s.	2,000,000		*103
Metropolitan Traction			146 00
Morristown L. H. &P. 5s, N. J.	30,000		*102
Morristown L. H. & P.	50,000	100 00	101 00
Nat'l Elec. Manuf. and Const. Co., N.Y.	50,000	100 00	101 00
N. E. Tel. & Tel. Co	10,394,600	100 00	60 00
N. Y. and N. J. Tel. and Tel. 5s	1,500,000		*98
N. Y. and N. J. Telephone Stock	2,535,000	100 00	97 00
N. Y. Storage Battery	100,000	100 00	96 00
North American Railway Co.	39,767,200	100 00	10 00
Postal Telegraph	10,000,000	100 00	83 50
Peninsular Elec. Lt. & P. Co., Va.	30,000	10 00	9 50
Pettingell Andrews Co., Boston.	200,000	25 00	30 00
Pittsburg Reduct. Co., Aluminum	1,000,000	100 00	105 00
Queen & Co., Phila.	600,000	100 00	100 00
Rockaway Elec. Light.	50,000	100 00	40 00
Sawyer-Man Elec. Light Co., N.Y.	125,000	100 00	100 00
Shaver Corporation, N. Y.	2,000,000	100 00	75 00
Short Elec. Ry. Co., Cleveland, O.	5,000,000	10 00	8 00
Standard Ug'd Cable Co., N. Y.	1,000,000	100 00	80 00
Suffolk Electric Co., Boston	300,000	10 00	10 50
Swan Incandescent	800,000	100 00	6 00
The Gamewell Fire Alarm Tel. Co.	750,000	100 00	100 00
The Hall Signal Co., N. Y.	1,900,000	100 00	100 00
The Hall Signal Co. pref., N. Y.	100,000	100 00	115 00
The Ongley Electric Co., N. Y.	250,000	100 00	85 00
The Siemens & Halske Co., Ill.	500,000	100 00	par
The Washington Wat. Pow., Wash.	1,500,000	100 00	90
The Wells & French Co., Ill.	600,000	100 00	par
T.-H. Electric Co. 5s, N. Y.	500,000	30 00	*101
U. S. Rubber Co.	13,481,000	100 00	45 00
U. S. Rubber Co. pref. 8s.	12,942,500	100 00	96 00
Western Union	100,000,000	100 00	97 00
Westinghouse Elec. & Manf. Co	7,000,000	50 00	76 00
Westinghouse Elec. Co. pref. 7s.	4,000,000	50 00	49 00
West Point W. Lt. & P. Co., Va.	25,000	100 00	101 00

*Per cent. †Registered stock.

FINANCIAL.

The January thaw and boom for 1893 may be written down among the things of the past. The heavy winter which we have had, whether it continues as such or passes off gradually from this date, assures us of abundant crops of all descriptions, rendering that great financial point a simple factor and in no way a source of trouble or annoyance, and there we meet the Exchange with a demand for work. The old stocks must be cleared off from the various shipping points and the elevators be cleared ready for the electrically shipped and manufactured crops. By the way, it is full time that the first half dozen electric elevators were completed and being tested at as many different stations. The blockades will be broken and the whole country alive in the morning, all moving towards the sea. The railways will soon get through their handling, collect their cash and tackle the Chicago obligations. We want to meet the choleraic conditions on the other side of the Atlantic, feed and keep it there. One of the very strong financial propositions in continuation of the so-called syndicate business, but which, as a matter of fact, is promotion and financial agency pure and simple, and which, if pushed with the vim shown by the Broadway street-railway men to date, will stir up ructions in every moneyed interest in the East where power is required, electrical or otherwise, is the investment of twenty millions of American capital in Canadian coal. The promoters know its value and exactly how to utilize it. It is the only large body of available coal which was left for a syndicate, and they own it all from the coast to the interior, where coal is plenty for light, heat and power. How in the world the British admiralty permitted this purchase to be consummated by an American syndicate is one of those problems beyond reasonable solution. I don't believe any of this stock will be placed on the market, but suggest that it should be listed and the public admitted to a share in the gross undertaking, especially as the syndicate are promoters and, consequently having secured their property and put it in condition to suit them, are through. The simple question now remains for them to take their profit by long or short payments. Twenty-five or $50,000,000 may be issued in the shape of 6% bonds or 7% preference shares, but unless convertible the investor will be tied down to a known income. In such cases as this he should, without the accompanying risk, share in the profit with the speculator. I crave a wad of that stock, and advise all who can, to put in every dollar they can afford to. Every corporation using coal in quantities east of the plains will benefit from this one. I fancy John Bull will wake up as soon as he has got Mr. Gladstone fairly seated as premier and see that he is dependent in Halifax on an American coal-dealing company for power to handle his ships and compete with Yankee corporations on supply and price. Then there will seem to be an explosion of 10,000 new and improved torpedoes in his coat-tails.

Another combination of capital and machinery which is very largely interested in electrics is the Henry R. Worthington corporation. The capital is placed at $7,500,000 in $100 shares; $5,500,000 of this is common stock, and, as usual, is retained by the vendors; $2,000,000 is preferred, and will carry the customary 7% over all other calls until a mortgage bond is issued. The company will seek to list the stock on the New York Stock Exchange, which will give it an extra value. The connection this company has had for years with mines all over the world will serve to introduce electricity in a great many mines. Have my readers who have been in the habit for the past 25 years of promoting and underwriting schemes, each reaching up into the millions of money, read the direct insult which the magistrate, Judge Perivier, goes clear around the block to administer when sentencing Count de Lesseps and his Panama

Canal people? His scold, as it comes to me, is as follows: "The directors had dealt with underwriting syndicates which, as far as their utility was concerned, were fictitious. In underwriting loans those syndicates had taken upon themselves no risks, and yet they had received enormous sums from the company. The expenses necessarily attendant upon the issue of loans had been grossly exaggerated by the directors, and this exaggeration constituted a fraudulent act." I claim that that is either an indictment of all respectable promoters and promoter underwriters of magnitude or an unwarranted judicial insult, and think it calls for an apology or demands a protest. One great trouble with the Panama business was its magnetism instead of electricity.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new

POSSIBLE CONTRACTS.

Ellenville, N. Y.—Efforts are being made to establish a municipal electric-light plant here.

Folsom, Cal.—The Folsom Electric Light and Power Company have extended the time to hand in bids for the long-distance power-transmission plant from this place to Sacramento.

Hutchinson, Minn.—The question of lighting this town by electricity is being agitated, and it is expected that it will be supplied in the near future.

Monett, Mo.—Colonel H. Ward Hicks has been granted a 20-year franchise for supplying electric light and power in this city.

Wetumpka, Ala.—The Wetumpka Falls Electric Power and Manufacturing Company proposes to establish a plant here.

Warrensburg, N. Y.—It is reported that an electric-light plant will be put in here as soon as possible on the site of the Burhans mills. John G. Smith is interested.

NEW CORPORATIONS.

Athol, Mass.—The Athol and Orange Street Railway Company. Capital, $100,000 Incorporators: C. R. McPherson, Cambridgeport; Charles H. Utley, Brookline; Edward C. Fowler and F. A. Dexter, Orange; Thomas H. Goodspeed and Lucien Lord, of this place; N. Sumner Myrick, Boston.

Chicago, Ill.—North Side Street Railway Company. Capital, $500,000. Incorporators: August Rieke, F. W. McNally and William Kirkpatrick.

Leominster, Mass.—Articles of association have been filed for the incorporation of the Leominster, Lancaster and Clinton Street Railway Company. Capital, $15,000. Incorporators: D. C. Nickerson, W. S. Reed, C. E. Dresser, H. L. Pierce, G. F. Morse, A. G. Morse, Cephas Derby, Clesson Kenney, Edward B. Tilton, George H. Cook, S. A. Stevens, A. A. Tisdale, Charles H. Shapley, Clarence Kenney, and A. W. Williams, all of this city.

Middletown, O.—The Middletown Power and Electric Railway Company. Capital, $100,000. Incorporators: Joseph Isenminger, W. O. Barnitz, Charles Goldman, George C. Jacoby and W. P. Noble.

New London, Conn.—A charter has been applied for by the New London Electric Light and Power Company.

Northumberland, Pa.—The Northumberland, Bloomsburg and Scranton Street Railway Company. Capital, $500,000. Incorporators: President, J. R. Coyle, Shenandoah; directors: H. O. Rodgers, George H. Troutman, T. H. Hutchinson, George A. Wilkinson, L. G. Emerick, Dominic E. Sweeney, A. T. McAllister, Hazleton.

Philadelphia, Pa.—The People's Traction Company has applied for a charter. Capital, $10,000,000.

Tiverton, R. I.—Petition has been made for the incorporation of the Fall River and Stone Bridge Electric Railway Company. Capital, $100,000. Incorporators: Nathaniel B. Church, Daniel T. Church, George W. Slade, Weaver Osborn and Marcus G. B. Swift.

Augusta, Ill.—The Augusta Electric Light and Manufacturing Company. Capital, $16.000. Incorporators, William Cohn, B. B. Crain and others.

Bath, Me.—The Knox Gas and Electric Company has filed articles of incorporation. Mr. Galen C. Moses of this city is interested in the company.

Chicago, Ill.—The Crescent Electric Light, Heat and Power Compay. Capital, $100,000. Incorporators: J. R. Bickerdike, T. D. Huli and Burton Johnson.

The Cushman Telephone Syndicate. Capital, $1,000,000. Incorporators: S. D. Cushman, H. L. Hollister I. M. Hay and others.

Cleveland, O.—The Elliott Electric Company has filed articles of incorporation. Capital stock, $35,000.

East Liverpool, O.—The Swaney Electric Company has filed articles of incorporation. Capital, $10,000.

Minneapolis, Minn.—Articles of incorporation have been filed by the Edison Building Company. Incorporators: S. G. Cook, C. H. Maxey, J. S. Porteous, J. M. Totten and J. K. Holdridge.

Niagara Falls, N. Y.—Power City Illuminating Company. Capital, $5,000. Directors: H. L. Brewster, Henry C. Brewster, A. Erickson Perkins, Haywood Hawks and Lewis A. Boore, Niagara Falls.

Sioux City, Ia.—The Plattsmouth Power Company. Capital, $500,000.

Wetumpka, Ala.—A charter has been asked for by the Wetumpka Falls Electric Power and Manufacturing Company. Capital, $100,000.

EXTENSIONS.

Beverly, Mass.—The Lynn and Boston Street Railway Company has been granted permission to extend its trolley system on certain tracks in this town.

New Brunswick, N. J.—The New Brunswick City Railway Company is contemplating extending its lines to the suburbs.

Niagara Falls, N. Y.—The Niagara Falls and Suspension Bridge Railway Company is contemplating extending its road to La Salle.

Northampton, Mass.—The street-car company has petitioned for permission to extend its lines and use electricity as a motive-power.

North Tonawanda, N. Y.—The common council has voted for the extension of the electric railway in this place.

"P. & B." PAINTS AND COMPOUNDS.

THIS rooster thinks he has good reason to crow, and a good many beings of the human kind who know what the rooster is crowing about are inclined to crow too, because they find satisfaction in using the goods of the Standard Paint Company, of No. 2 Liberty street, New York. The P. & B. compounds enjoy a well-merited reputation among electrical people who have tested and used them, and the demand for the goods is increasing all the time. P. & B. compounds and paints are claimed to be the best of insulating materials. They are thoroughly waterproof, and when dry practically fireproof, and they are largely used for painting mouldings in which electric wires are run. These substances are also acid and alkali proof, besides being excellent insulators, and they are particularly valuable for such uses as for circuit and switchboards, lamp hoods and frames, poles, brackets, cross-arms and pins, insulated blocks, battery and accumulator shelving, trays and frames, converter boxes and connections, dynamo and motor boxes, benches or floors where primary acids are used. P. & B. compounds are largely used for coating lead-covered and other cables for underground use and for insulating overhead wire.

Mr. David R. Walker, chief of the Electrical Bureau of Philadelphia, in his official report for 1888, speaks very highly of the value of P. & B. compounds as a protection for lead-covered cables, and mentions the fact that cable so protected, laid on Broad street in that city, at the end of one year showed no deterioration whatever. Since that time the bureau has used the compounds for this purpose with the same satisfactory results.

Besides these paints and compounds the armature and field-coil varnishes, insulating tapes and papers made by this company continue to find favor and increase in demand.

The Standard Paint Company is constantly establishing agencies throughout the country. The Southern Electric Co., Baltimore, Md., the Robbins Electric Co., Pittsburg, Pa., and the Ansonia Electric Co., Chicago, as well as supply-houses in the most prominent cities, speak very favorably of these goods. Arrangements have just been closed with the Warren-Ehret Co., of Philadelphia, to represent the Standard Paint Company in that city and vicinity. This house is said to be the largest of its class in the State, and the P. & B. specialties are fast becoming known through its efforts.

The Washington Carbon Co., Washington, Pa., has secured a contract for $5,000 worth of carbon for the World's Fair management.

BIOGRAPHICAL SKETCH.

DR. ROBERT TAYLOR.

The accompanying illustration shows the features of Dr. Robert Taylor, the genial, widely known and universally liked vice-president and secretary of the Wright Universal Electric Company, 26 Whitehall street, New York city. Dr. Taylor is a man of ambition and exceeding promise. We have known him for several years, and it affords us pleasure to testify to his good qualities and sound business judgment. Possessing only a limited knowledge of the business when he connected himself with this company, he is to-day thoroughly conversant with it in all its details, and evidently enjoys the fullest confidence of the company, who has placed upon him responsibilities which he has discharged creditably. We predict for him continued success.

DR. ROBERT TAYLOR.

ELECTRIC SELECTOR AND SIGNAL COMPANY.

With the assent of 99 per cent. of the stock and bond holders of the Electric Secret Service Company all of the property, patents, business and good-will of that company were sold by C. P. MacKie, receiver, on February 11, 1893, to the Electric Selector and Signal Company. This new corporation has likewise acquired other important inventions relating to the general subject of electrical selection, and proposes to develop this especial business as applied to telegraphs, block signals, electric light and power and telephones in this country and abroad on a larger scale than the company which it succeeds. The change has been effected without interruption of the business of the Electric Secret Service Company, and upon terms which provide for a settlement of all of that company's obligations in full in cash. The Electric Selector and Signal Company will, we understand, have the same technical management as the Electric Secret Service Company, although its board of directors will contain several new and influential names.

PHILLIPS INSULATED WIRE COMPANY.

The Phillips Insulated Wire Company, of Pawtucket, R. I., will hereafter have its headquarters at 39 and 41 Cortlandt street, New York city, which will be occupied by the new president, Mr. H. C. Adams, and his staff. This company will manufacture all kinds of insulated wire, such as triple-braided weather-proof, damp-proof office wire, etc., and has adopted as its trade-mark " O. K," letters standing out in white colors on a black background. The " O. K." brand of weather-proof insulated copper wire, which is manufactured for electric-railway feeder wires, and line and house wires for electric-lighting plants, is claimed to stand the best insulation test, and is more handsomely finished than any other of like character in the market.

"OKONITE."

Before the National Electric Light Convention has drawn to a close we will have heard a great deal about "Okonite," "Captain Candee," "Geo. T. Manson" and the Okonite Company (Limited). There is a good reason for this. "Okonite" is rated above par as an insulating medium. Captain Candee and Geo. T. Manson are jolly good fellows, bright lights, who would be sorely missed at any gathering of the electrical fraternity, and the Okonite Company (Limited) is one of the best known and most pushing and enterprising concerns in these grand and glorious United States. The "Captain" has just returned from a six weeks' trip abroad, whither he went in the interests of that wonderful compound, Okonite, and reports the affairs of the company at the London headquarters in a flourishing condition. "Okonite" has made a grand record in this country, and is undoubtedly the most popular insulating material made. It is regarded as the highest insulation known. If you use "Okonite" insulated wires and cables you use what are claimed to be the best. They are very tough and tenacious and are not affected by extreme changes in temperature. For electric-light, telephone and telegraph purposes they stand unrivalled. If you are at all sceptical on this point, tackle the "Captain" or Geo. T.—but be careful how you do it.

CLAUS DYNAMOS.

In a letter to P. Claus & Co., dated December 27, 1892, Mr. W. A. Cromwell, custodian of the New York Cotton Exchange, speaks very highly of the performance of the Claus dynamo now in operation for the lighting of that building. Mr. Cromwell says:

"During the three years that your machine has been running here, it has never cost one cent for repairs. The dynamo runs 16 hours every day out of the 24 under an ever-varying load, and we have never been compelled to stop the lights even for a minute.

"The ever-increasing demand for light compelled the executive committee to order the purchase of an additional machine for the coming year.

"From all sides proposals came in, dwelling on the extraordinary improvements that have been made in the last years. Most of the claims were thoroughly investigated; however, we had to fall back on your dynamo again, the improvements in which have kept pace with the times. Our old dynamo makes 1,150 revolutions, and the new one (also a 500 L. machine) only 600. The bearings are self-oiling and self-centring. The new commutators are of Eureka tempered copper. All your customers having one of your late machines were full of praise for same, and so we consider it our own profit to again place the order with you."

TRADE NOTES.

The New Castle Steel Co., New Castle, Pa., is placing a 200 H. P. Ball engine, manufactured by the Ball Engine Co., Erie, Pa.

The Milton Electric Light Co., Milton, Pa., is putting in a 100 H. P. Ball engine, furnished by J. W. Parker & Co., Philadelphia representatives of the Ball Engine Co., Erie, Pa.

W. S. Chesley & Co., 24 Morris street, Jersey City, N. J., are prepared to do all kinds of repairing necessary for any make or variety of electric-light and power apparatus. They have sixty horse-power for testing purposes. They also buy and sell all kinds of street-railway and electrical apparatus and are able to furnish new machines of any description.

B. W. Payne & Sons, 41 Dey st., New York, the well-known manufacturers of Corliss engines, which are extensively used in electric light and power stations, are doing a fine trade. Among the late plants installed by them may be mentioned the following: 100 H. P. engine in Miner's Eighth Avenue Theatre, New York city, which is lighted on the General Electric Company's system; Miner's Theatre, Newark, N. J., also Miner's Fifth Avenue Theatre, New York city. In the two latter places they put in Payne Corliss engines, while in the Eighth Avenue Theatre Payne single-valve automatic engine was installed. The firm put in the complete steam plant in these three theatres. They installed the complete steam plants of the Kingston City Railway Company, Rondout, N. Y. The engine of this plant is of the Payne Corliss type, 400 H. P. The Payne Corliss engines are known by all power users for their excellent qualities. They are simple in construction, have close regulations, small fly-wheels and large range of power.

"BEST BATTERY ON THE MARKET."

Johnstown, Pa., Jan. 18, 1893.

Jerome Kidder Mfg. Co., 820 Broadway, N. Y.

Sirs: Please send me price of platina or positive pole of your Home medical battery. I have used your battery for six years, and can say that it is the best battery on the market. Respectfully, C. F. Lancaster.

The Electrical Age's Illustrated Record of Patents.

Issued February 14, 1893.

491,531. Electrical Signalling Apparatus. Jacob B. Currier, Lowell, Mass., assignor to the Currier Telephone Bell Company, of Massachusetts. Filed Dec. 15, 1881.

491,532. Electric Governor for Signalling - Circuits. Jacob B. Currier and David H. Rice, Lowell, Mass. Filed Dec. 1, 1882.

491,548. Electric-Arc Lamp. Frederick D'A Goold, Schenectady, assignor to the Edison General Electric Company, New York, N. Y. Filed April 15, 1892.

491,560. Coulombe-Counter. George Hummel, Nuremberg, Germany. Filed Feb. 16, 1891. Patented in Germany.

491,561. Incandescent-Lamp Socket. Joseph Hutchinson, New York, N. Y., assignor to the Edison General Electric Company, same place. Filed June 11, 1891.

491,567. Conductor for Armatures. Emil Kolben, Schenectady, assignor to the Edison General Electric Company, New York, N. Y. Filed Feb. 8, 1892.

491,568. Armature and Means for Supporting the Same. Emil Kolben, Schenectady, assignor to the Edison General Electric Company, New York, N. Y. Filed Feb. 8, 1892.

491,595. Telegraph-Transmitter. Robert S. Roberts, Philadelphia, Pa. Filed April 29, 1892.

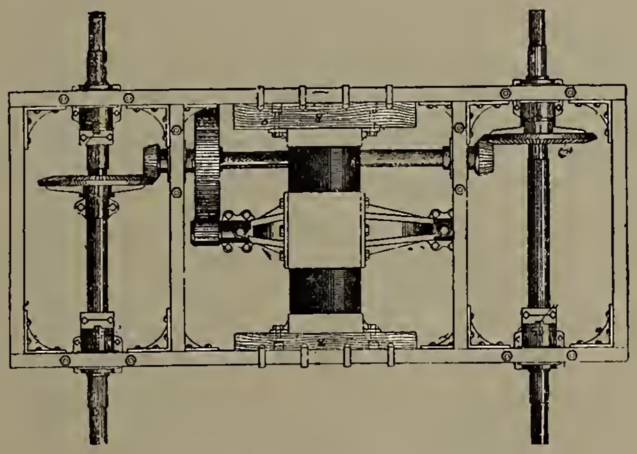
491,596. Electric-Lamp Fixture or Bracket. James T. Robb, Mount Vernon, assignor to the Edison General Electric Company, New York, N. Y. Filed Aug. 31, 1891.

491,603. Duplex Electric-Arc Lamp. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Oct. 27, 1890.

491,604. Electric-Arc Lamp. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Oct. 30, 1890.

491,605. Cut-Out for Arc Lamps. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Dec. 1, 1890.

491,666. Electric Locomotive. Sidney H. Short, Cleveland, Ohio, assignor to the Short Electric Railway Company, same place. Filed Jan. 16, 1891.



491,857.—ELECTRIC LOCOMOTIVE.

491,682. Bushing for Incandescent-Lamp Sockets. Cromwell A. B. Halvorson, Saugus, assignor of one-half to Robert B. Lincoln, Boston, Mass. Filed April 4, 1892.

491,684. Manufacture of Secondary-Battery Electrodes. Robert McA. Lloyd, New York, N. Y. Filed Sept. 30, 1892.

491,688. Switching System for Telephone-Exchanges. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed May 19, 1892.

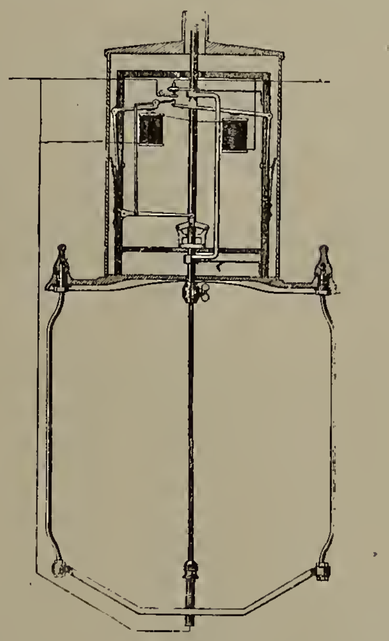
491,692. Time-Circuit Closer. Robert H. Twigg, London, England. Filed Aug. 9, 1892.

491,700. Method of Electrolytically Producing Soda and Chlorine. Elisha B. Cutten, New York, N. Y. Filed Dec. 30, 1891.

491,701. Method of Electrolytically Producing Potassium Chlorate. Elisha B. Cutten, New York, N. Y. Filed April 11, 1892.

491,707. Electrical Insulating Conduit. Charles W. Jefferson, Schenectady, N. Y., assignor to Eugene Munsell & Co., New York, N. Y., and Elizabeth, N. J. Filed May 21, 1892.

491,708. Electric Motor and Dynamo Mica Insulator. Charles W. Jefferson, Schenectady, N. Y., assignor to Eugene Munsell & Co., New York, N. Y., and Elizabeth, N. J. Filed June 1, 1892.



491,604.—ELECTRIC-ARC LAMP.

491,713. Electric Head-Lamp. William Main, Brooklyn, N. Y. Filed Oct. 29, 1892.

491,726. Accumulator. William A. Macleod, Boston, Mass. Filed Dec. 17, 1890.

491,729. Insulator. Louis McCarthy, Boston, Mass. Filed Aug. 8, 1892.

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In a letter from the Inspector of the Boston Fire Underwriters' Union, he says:

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The rubber used in insulating our wires and cables is especially chemically prepared, and is guaranteed to be waterproof, and will not deteriorate, oxidize or crack, and will remain flexible in extreme cold weather, and is not affected by heat. The insulation is protected from mechanical injury by one or more braids, and the whole slicked with Clark's Patent Compound, and special extra finish, which we have now adopted for all our solid wires as an extra weather-proof protection, and also preventing chafing and abrasion, which is water, acid, and to a very great extent fireproof. Our insulation will prove durable when all others fail. We are prepared to furnish Single Wires of all guages and diameter of insulation for Telegraph and Electric Lights from stock. Cables made to order. We are now prepared to furnish our Clark Wire with a white outside finish for ceiling cleat work as well as onr standard color.

Clark Joint Gum should be used for making waterproof joints. This is put up in half-pound boxes, in strips about one foot long and five-eighths inch wide, and when wrapped about a joint and pressed firmly it makes a solid mass. **FOR RAILWAY** and **MOTOR** use we make all sizes of stranded and flexible cables with Clark insulation.

WE GUARANTEE OUR INSULATION WHEREVER USED. AERIAL, UNDERGROUND OR SUBMARINE, and our net prices are as low, if not lower than any other first-class Insulated Wire. We shall be pleased to mail Catalogues with terms and discounts for quantities.

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61 to 65 Hampshire Street, Boston, Mass.

HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician.

PATENTS—Continued.

491,758. Electric Signalling Apparatus. Ludwig von Orth, Berlin, Germany. Filed April 14, 1892. Patented in France, Belgium, Norway and in Italy.

491,824. Electric-Alarm Money-Drawer. William J. Walker, St. Louis, assignor of one-half to Alexander L. Bedford, Savannah, Mo. Filed Oct. 29, 1892.

491,829. Electric-Motor Regulator. Joseph A. Williams, Canal Dover, Ohio. Filed Feb. 11, 1892.

491,857. Electric Locomotive. Frank B. Rae, Detroit, Mich., assignor to the Detroit Electrical Works, same place. Filed April 11, 1891.

491,874. Electric Signal. Frank H. Clarke, Springfield, Ohio, assignor of one-half to Alfred L. Clarke, same place. Filed Oct. 24, 1892.

491,878. Secondary Battery. Nathan H. Edgerton, Philadelphia, Pa. Filed July 11, 1892.

491,890. Insulator. Andrew L. Johnston, Richmond, Va. Filed May 4, 1892.

491,893. Telephone-Call. John H. Kinsman, Bridgeport, Conn. Filed Jan. 20, 1892.

491,915. Electric-Arc Lamp. William H. Akester, London, England. Filed Sept. 9, 1892.

491,916. Electric-Arc Lamp. William H. Akester, London, England. Filed Sept. 9, 1892.

491,934. Cable-Grip. Arthur O. Babendreier and Frank P. Davis, Baltimore, assignors of one-half to John E. Norwood, Sykesville, Md. Filed Dec. 20, 1892.

491,945. Self-Winding Electric Clock. Emil Klahn, West Hoboken, N. J., assignor to Daniel C. Hood, New York, N. Y. Filed Feb. 17, 1892.

491,970. Electric Motor. Alexander W. Meston, St. Louis, Mo. Filed June 15, 1891.

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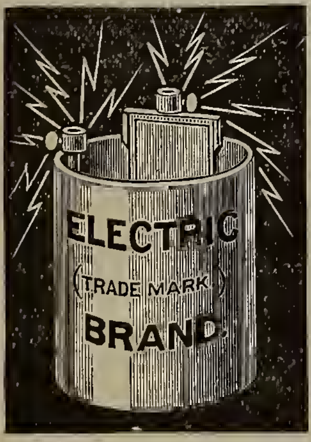

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CONVENTION REPORT BY TELEGRAPH.

For the first time in electrical journalism the ELECTRICAL AGE in this issue contains a telegraphic report of the proceedings of a convention of representatives of large electrical interests. The report in question is of the meeting of the National Electric Light Association, which was held in St. Louis, Mo., this week, and each day's proceedings were telegraphed directly from St. Louis to the ELECTRICAL AGE office as soon as the report could be prepared. By this piece of enterprise the ELECTRICAL AGE is enabled to present to its readers the story of the interesting convention several days in advance of all other electrical journals, which naturally depend upon the mail to get the report. Such means of communication on important occasions are, however, too slow for us. Our readers do not care to wait a week or more to learn what transpired at an important convention, hence our departure from the time-worn rut. The late appearance of this issue is due to the fact that the convention did not adjourn until Thursday, and it required some lively work to get the paper out so early under the circumstances. We feel, however, that our readers will be satisfied in view of the fact that they are thereby enabled to get the convention news earlier than usual in such cases.

A NEW INCANDESCENT LAMP.

So far every effort to manufacture incandescent lamps without infringing the Edison patent has utterly failed, but it is not in the nature of things to assume that that patent covers the only and true way to make an incandescent lamp—that it is the limit of possibility and ingenuity in that direction. There is a tremendous incentive to invent a lamp that will be different in its nature to the Edison device, and while at the present time the inventive ingenuity of this country seems baffled, it is not reasonable to suppose that the task cannot be accomplished. Leaving out of the question the Westinghouse stopper lamp, which is yet to be adjudicated upon as regards its relationship to the Edison lamp, we desire to call attention to a lamp, which we bring to public notice for the first time, on another page in this issue. This device, which is of the invention of Mr. Robert J. Sheehy, of New York city, a well-known and able electrical inventor, seems to possess many features which are worthy of very earnest attention from those interested in incandescent lighting. It will be readily observed that this lamp in essential respects is a radical departure from that of Edison in its construction, and Mr. Sheehy thinks that it does not infringe the Edison patents at any point. Such a lamp can be made to do reliable work without a vacuum within the tube containing the filament, and in other respects the lamp seems to possess important features. By this method of construction the illuminating capacity is increased on account of the proximity of the reflective surfaces of the glass to the incandescent filament, and it is said that when the filament is incandescent the glass surfaces of the tube reflect the light to such a degree as to make it appear as if the tube itself was also incandescent. There are many other extremely interesting points about this lamp, and we are informed that it is regarded with deep concern at this juncture by those directly interested in such matters. The Edison lamp is the unrivalled possessor of the incandescent field at present, but it would be hazardous to say that it will always be so. A lamp may be produced some day that will be a match for it, and that lamp may be the one we refer to.

THE ST. LOUIS CONVENTION.

THE "ELECTRICAL AGE'S" SPECIAL TELEGRAPHIC REPORT OF THE PROCEEDINGS.

St. Louis, Mo., February 28.—The sixteenth convention of the National Electric Light Association met in the Bell Telephone Building at 10:30 this morning with a large attendance.

President James I. Ayer introduced the Hon. A. E. Noonan, mayor of St. Louis, who made a few remarks of welcome.

His honor said that it had been his privilege as mayor to welcome many bodies to St. Louis representing the great forces of modern civilization, but at no time had he greater pleasure than on the present occasion, when he stood before those engaged in studying the most far-reaching force known to man—a force which, like a gleam of light, is illuminating all the actions of man; nay, is even transfiguring the every mechanism of man—investigators who are adding to forces and powers heretofore unknown or very little understood, and to bring them into the service of humanity. This force is electricity. How far and to what extent this force may be developed, to what far-reaches it may carry us, is a problem not even within the view of the wizards in your realm.

The mayor then said: "You have gathered, gentlemen, in the greatest electrical city in the world. The claim may seem strange, for we are far from the east, where energy is supposed to reside, and we live in a large valley where the southern breeze is supposed to infect the people with a taint of lethargy. Still you will find here a city of 500,000 people, where are located the greatest electrical plants in the world and where we have most successfully harnessed that primeval force that was born when light was born and air was born. It gives me pleasure to remark—and I may be excused from boasting—that it was my privilege three years ago to contribute in a most important way to this splendid state of things. As mayor of this city, in the approval of legislation to change the street-car service in our city, I did more in behalf of electricity than any three mayors in christendom ever had the privilege of doing.

"You are welcome to the electrical city; you should be specially at home here. All our sympathies are with electrical people.

"It is in pursuance of an old custom, but a very pleasing one, that I extend to you the freedom of the city, and formally assure you of our esteem, our hospitality and our affection. The city of St. Louis is yours and your wives, your daughters and your sweethearts, if you have any with you." (Applause.)

President Ayer then introduced Mr. Robt. McCullough, president of the St. Louis Electric Club, who echoed the mayor's greeting and assured the visitors that nothing had been left undone and no pains had been spared to make their stay in St. Louis a pleasant one.

President Ayer then addressed the convention. He referred to the general growth of knowledge of science and its application throughout the country, and dwelt at some length on the unusual developments of the practical side of the science. A matter to which the speaker asked the attention of the gentlemen present was that to the recent patent decision in the courts. He regretted that the inventor was judicially deprived of his rights. It was a drawback to both the investor and inventor that the station-manager, among other qualifications, must possess the ability to divine what the courts may do in the future.

Mr. Ayer suggested that work for the betterment of this state of affairs be at once begun. He then turned to the electrical prospects of the World's Fair, of which he took a most encouraging view, predicting magnificen achievements. The speaker spoke with pleasure of the increasing interest in educational circles, and predicted that through this method the great difficulty of finding skilled men to perform the duties in the profession would soon be done away with.

At the close of his speech President Ayer read a telegram from ex-President C. R. Huntley, of Buffalo, regretting his inability to be present, owing to the loss by fire of his largest station.

Among the communications read by the secretary was one from the electricians of Omaha asking that that city be chosen as the place for holding the next convention.

On motion of Judge E. A. Armstrong the matter was referred to a committee.

The president cordially invited all visiting delegates to make the St. Louis Electric Club their own quarters, and stated that his carriages would be ready at the Southern Hotel to take those who wished to visit the stations of the Electric Light and Power Company, the Municipal Electric Light Company and the Union Depot Railroad Company's power-house.

The paper of A. D. Adams, entitled "Wrought *versus* Cast Iron for Field-Magnet Frames," was then read. An abstract of this paper is given elsewhere.

Judge E. A. Armstrong, of Camden, N. J., then read the report of the Committee on the Columbian Exposition. The report begins with a statement of the electric lighting of the Paris expositions of 1882 and 1889, and of the expositions at New Orleans and Louisville. At Chicago the World's Columbian Exposition Company has placed contracts for 4,500 arc lights of 2,000 nominal candle-power and about 80,000 incandescent lamps, and will have about ten thousand more lamps as special exhibits. It has placed contracts for 2,900 horse-power of generators. The contracts for electrical fountains require an installation of 100 horse-power capacity, and the total aggregate of the electric installation amounts to 19,500 horse-power. The aggregate of boiler capacity is 18,000 horse-power on the standard rating of thirty pounds of steam per horse-power. With such an efficiency as ought to be realized there is an effective total of about 24,000 horse-power. These figures show that electricity will be employed at the Columbian Exposition on a scale far eclipsing that of any of the great fairs since electricity has been used as an illuminant. An interesting feature of the plant will be the use of oil as a fuel, and a point of exceeding interest in the engine and dynamo room will be the very large adaptation of dynamos to Corliss and medium-speed types of engines in direct-connected combination. Next to the universal distribution of electric power for all purposes, to all points of the grounds, the most marked advance of the time is the application of electricity to the transportation service of the exposition. This service will be by a three-mile double-track elevated railroad, with block signalling systems, power-brakes, all electrical. It will be operated from an independent power of more than the aggregate capacity installed at the Paris Exposition.

The report denies sensational stories telegraphed from New York that many of the prominent electrical firms in that State had decided to pull out of the exhibit. Every foot of space in the great building has been taken and every electrical concern of any consequence in the world will be fully represented. The active work of preparing for the exhibits has been going forward for some weeks, and many of the electrical firms have made substantial progress in the erection of the booths. The International Congress under the auspices of the World's Columbian Auxiliary promises to be of remarkable interest. Prof. Elisha Gray is at the head of the electrical branch, and he has every assurance that the gathering of electricians from all parts of the world will be a grand one.

Mr. R. H. Sterling, of Denver, Col., next read a paper entitled "Some Experiences with the Alternating System," and was followed by Capt. Wm. Brophy, who submitted a paper on "Relation of Insurance to Electric Lighting and Power." [Abstracts of these papers will be found elsewhere in this issue].

Adjournment was then taken till afternoon.

The afternoon session was opened at 2:30 o'clock, and Capt. Wm. Brophy opened the proceedings by reading a paper on the "Relation of Insurance to Electric Lighting and Power." An abstract of this paper follows.

Mr. W. J. Hammer, of New York, spoke of the antagonism between the underwriters and electricians and said that the electricians would certainly not submit to being dictated to by the underwriters. Adjourned till Wednesday morning.

WEDNESDAY'S PROCEEDINGS.

President Ayer introduced Prof. George Forbes, of London. Professor Forbes stepped forward and was greeted with applause. He read a paper on "Thermal Storage for Central Stations." It was somewhat long but plain straightforward. "It has long been evident," said he, "that storage of some kind might lead to great economy in central-station work. The reason is that the demand for light has in most cities a maximum for only two or three hours of the day, requiring the plant to lie idle the rest of the day. The defect is gotten over to some extent by having engines of small power to carry the day load." Storage batteries have been thought to be a means of overcoming the trouble; they have proved so, but at an enormous capital expenditure with a loss of 20 per cent. in the energy given in the batteries. In a hilly country the engines could be working all the twenty-four hours by pumping water to a high reservoir and the water could be conducted to turbines that would run dynamos. During the day the reservoir is being filled and during the evening is being emptied. But these advantages do not exist everywhere. Professor Forbes explained at great length the scheme invented by Mr. Drewitt Halpin, of England. He proposes to use boilers of the average capacity and at times of light load the steam is carried through pipes into large iron reservoirs of cheap construction, the steam being used to heat up the water in the reservoirs to a high temperature and pressure. When the heavy demand comes on the evening steam is drawn from the reservoirs. The losses of heat from radiation from the reservoir can be made very small; in fact, quite imperceptible.

This is the general scheme of this plan but there are advantages not apparent at first sight. Purer water is supplied to the boilers; another is that there is no priming in the boilers, as the steam is supplied to the engines from the reservoirs. The adoption of the plan would not reduce the number of boilers required but actually doubles the capacity of each boiler.

Professor Forbes produced figures showing the reduced cost of installing thermal-storage plants as remarkably below that of existing plants, with a considerable balance in its favor on the score of annual charges.

He made statements with reference to the burning of "garbage" which created a marked impression and were almost sensational in their effect. He was questioned as to the amount of work this refuse would do, and he said that experience had shown that some thirty pounds of refuse would yield the equivalent of five pounds of coal.

Professor Forbes concluded his remarks amid general and hearty applause.

The president called upon Dr. Louis Bell, of Boston, to open the discussion of Professor Forbes' paper. The doctor said that electricians were fully alive to some kind of storage. His own opinion was in favor of the practicability of the storage of water-power. His mind was not made up concerning thermal storage, but he was profoundly impressed with the claims made by Professor Forbes in behalf of the Halpin scheme of storage.

In reply to a query Professor Forbes said that the Halpin scheme had not been put into operation, the patents having only lately been granted, but a plant is soon to be installed at Wolverhampton, where also the "Utilizers" were to be employed. Storage batteries were mentioned, and some delegate got the idea that he [Forbes] had spoken disparagingly of the scheme, but he disclaimed such a view of storage batteries. On the other side of the Atlantic the storage battery was largely used, but here it seemed to be in great disrepute, and he wondered why American experience was so much against it.

Questions were fired at Prof. Forbes from all quarters, and he replied promptly and interestingly and in a manner that captivated the association. Prof. Forbes made a very favorable impression on his hearers.

A paper was then read by Mr. L. B. Stillwell, of Pittsburg, entitled "Under what Conditions is the Use of Water-Power Economical?"

Previous discussions of this question, said he, embraced talk about "volts," "ampères," "cycles" etc., but the first inquiry should be, "Does it pay?" The problem is a very complex one; there are many factors and they are nearly all variable; their value depends upon a variety of local conditions and no general solution can be worked out. Very few who are operating central stations know what their power is costing them. The central stations now generally use coal in the production of energy and through various types of electrical apparatus. The use of water is extremely limited. Yet there is perhaps no question of greater interest to owners and operators of central stations than that of the relative economy of transmission plants utilizing water-power; and it will be interesting to consider the general problem of economics of central-station operation in the light of how experience in the operation of the former class of plants may be made useful in predicting what may happen if water-power be substituted for steam.

In the one case a steam plant is used; in the other the power is derived from water. But the electrical apparatus in both may be regarded as substantially similar; that the two plants are capable of delivering the same amount of power to the local distributing circuits and that they are alike as regards revenue. The question would then be: "What are the total annual charges against a hydraulic and a steam institution respectively?"

But the proper factors largely depend upon results of experience in the operation of plants sufficiently similar to make comparisons between them fairly safe and accurate. Data relating to such experiences is at the present time very difficult to obtain, and the object of this paper was merely to bring together the various items of expense in such institutions, and to suggest to the members of this association to provide from their experience the data concerning the economies of central-station operation and the distribution of light and energy for light-power purposes as will be of value in judging of the practicability of the thousands of projects of this description which will be under consideration within the next ten years, so that the association may compare, analyze and arrange this information in such a way as to make its application to a new project direct and reasonably conclusive. By this means failure in ventures of this kind may be avoided. The problem is complex, and unless we have some definite and progressive method of analysis it is practically impossible, with reference to a specific case, to arrive at conclusions in which all will concur.

Mr. Stillwell then catalogued the items concerning which data should be gathered, and concluded by remarking that the evolution of apparatus adapted to the utilizing of the vast amount of power in the form of water now wasted has reached such a stage as to make the question a most vital one, and make exceedingly manifest the importance of information relating to the comparative cost of steam-electric plants now in operation.

THURSDAY'S PROCEEDINGS.

The proceedings opened with a paper by Mr. Wm. H. Browne, of New York, on "Underground Conduits and Conductors, and the Experiences of Electric Lighting Companies of New York City." The paper was read by Mr. W. J. Hammer. These experiences, Mr. Browne said, were unique and they afforded companies elsewhere opportunities for beneficial consideration. The story begins with 1880–81, when two companies began electric lighting in New York city. Being pioneers, they had all the trouble that attends those who work in untried fields, and they struggled with adverse conditions until their success induced, in 1884, the incorporation of six more electric-light companies, some of whom deemed it inadvisable and expensive to erect poles of their own, so they leased poles from other parties. From 1884 to 1885 the wires for telegraph, telephone messenger service, police and fire alarm filled the air, and there began to be a demand that these wires should be buried. The electric-light wires were so few as to be scarcely noticeable and did not attract attention. In 1884–85, however, laws to bury the wires were passed and the telephone companies got into line with the subways company, but the electric-light companies stood out. In 1888 the electric-light subways were first opened, but their use was greatly resisted by the electric-light companies, and a tremendous controversy ensued. Finally, in 1889 the city declared destruction to the overhead wires, and the electric companies had to succumb. The situation in New York is as follow: Some 600 miles of ducts have been built; of this about 260 miles, or 42 per cent., are rented by the companies. Included in the latter are about fifty miles not yet occupied with cables. At the present only about one-third of the ducts built are occupied with cables; there are instances of subways built in excess of requirements. On the Broadway there are 200 miles of ducts and only 80 miles are occupied; on Third avenue 142 miles and but 41 occupied; on Twenty-Third street thirty-four miles built and eleven miles occupied; on Twenty-ninth street twenty-eight miles built and seventeen miles occupied; and it is very reasonable to assume that the increase of the occupation of subways on these streets will never require all the ducts built. Of the 600 miles of ducts 454 miles were built prior to 1890, and included in that destruction were the streets above named, in which there continue to be so large a number still unoccupied. During 1892 twenty-four miles of ducts were built along nearly 10½ miles of streets. If the work could be begun now in the light of present experience the average number of ducts per mile of street would not probably exceed three. For all kinds of service one duct will provide ample accommodation in the great portion of the city. There is no reason to doubt that in the light of the experiences possessed by those familiar with the situation fully as satisfactory accommodations and results to all interested could be accomplished at not exceeding 25 per cent. of what it has cost and with corresponding beneficial conditions.

Much of the paper was devoted to a discussion of the various conditions under which the companies have furnished light to their patrons.

Mr. A. J. De Camp, of Philadelphia, admitted that the paper was a very able one, but he thought its value would have been much greater if the author had undertaken to give the views of the electric-lighting companies that had been compelled to go under the ground in New York city. He emphatically declared that no electric-lighting company could comply with the provisions of the law in New York and live. Still he thought it wise for electric-light companies to accept the inevitable fight that is coming everywhere either to get the municipality not to force them underground or to get them to kill the companies as easily possible, for, in his judgment, compliance with the law meant bankruptcy. It seems to him strange that good business men show so little judgment when they become city legislators. It is not clear why there should be so general a cry that wires should go underground. The customers do not care whether they get their current from overhead or underground wires, and it would seem that the newspapers were largely responsible for the excitement. In his judgment the New York companies could not comply with the law, pay the conduit charges, and pay one per cent. on their investment. The speaker's solution of the problem was to let the city build the conduits as a public work like water or gas. Let the city legislators make a statement of the cost of the work of building subways and submit a statement to the public that a tax would be levied for that purpose, and when the matter came to a public vote he thought the electric-light companies would not be troubled so much concerning the putting of wires underground. But to compel them to build the conduits and to place their wires therein or to compel them to go underground at such an expense as is imposed in New York would be ruin unless they could increase prices.

Mr. M. J. Francisco said that there was no question as to the feasibility of working the wires underground. The question was one simply of a tax. In New York the companies were, he understood, assessed $4,500 per mile for one duct and the business would not stand that. His scheme was for the city to build the conduits and the legislature to pass a law fixing the rental of conduits.

Mr. Moore, of New York, said that he had been through the underground war in New York, and he gave a laughable account of some phases of the controversy. The situation was death to them financially, as manufacturers of the electric light. Their commercial lighting was all that saved the companies. He was not clear as to the suggestion that the city should build the conduits. This might lead up to the city's running its wires into the conduits and then there might be a "municipal plant" looming up, and that was certainly not what was wanted.

Mr. De Camp replied that if the city were to build and own the conduits it would be something of a partner in the business and would not be likely to proceed to unreasonable lengths in dealing with the electric companies.

Mr. Calvert Townley then read a paper on "The Incandescent Lamp from a Commercial Standpoint," and was followed by Judge E. A. Armstrong, of Camden, N. J., with a paper entitled "The Morals of Corporations." An abstract of this paper will be found elsewhere in this issue.

Judge Armstrong's paper was followed by one on the "Preservation of Poles and Cross Arms," by H. C. Myers, an abstract of which is given on another page.

The incandescent-lamp question, which was regarded as the most important to be presented to the meeting, then came up for consideration, and the grievances of the central-station men were presented by T. Carpenter Smith, of Philadelphia. After a little discussion, however, the matter was rather unexpectedly referred to

(*Continued on page* 143.)

RELATION OF INSURANCE TO ELECTRIC LIGHTING AND POWER.*

BY WM. BROPHY.

Those engaged in the insurance business and those engaged in the manufacture and sale of electric-lighting apparatus, as well as those who furnish electric light and power, have one common end in view, viz., to secure at least a fair return on the capital invested in their business and for their own time and labor. Each of these interests needs the help of the other, and there is no good reason why one should antagonize the other. That this has been done in the past I will not deny, but to say that the insurance companies were wholly to blame for their hostility to the introduction of the electric light would be manifestly unfair, to say the least.

Insurance companies have paid dearly in the past for the mistakes of those engaged in the introduction of all modern forms of artificial illumination and many forms of heating, a few of which I will here enumerate.

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How to deal with this new and to most people's minds dangerous element was a most serious question with the underwriters of this country. To many it seemed best to increase rates all along the line where it was introduced, and thus prevent or discourage its use. Had such action been taken there is no doubt but it would have had the effect of retarding the growth of the electric-lighting business very greatly indeed. Fortunately, this last expedient was resorted to in only a small portion of this country.

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The real fact in the case is that millions of insurance has been placed by the agents and brokers on property that is far more hazardous than the very poorest electric-light plant in the business portion of the city in question; ordinary prudence having been thrown to the winds in writing such insurance, the inevitable consequences of such folly ensue, viz., disastrous fires. The agent who sees a possible loss of commission hastens to give a plausible excuse to his companies by charging the origin of the fires to electricity and demands an investigation of the fire department for not extinguishing them before they were kindled, concealing the fact that his own methods of placing insurance encourage incendiarism and promote carelessness.

In view of the fact that it is now proposed to add a small charge to the rate of insurance where electric lights "are installed in compliance with board rules and specifications," and a charge of 25 cents where they do not meet with the approval of the insurance inspector, I would advise you to pursue the following course:

Where a company does its own wiring for its customers, proceed with as much care as though the building in which you are installing wires and fixtures was your own, and you had no insurance on it. Where the work is done by others, inspect every foot of wire, every joint, cut-out, switch and insulator, and on no account turn on current until you are satisfied that it is as safe as it is possible to make it. Do not rely on the uncertain movements of the insurance inspector or any other system of inspection that too often fails to inspect. You are the one whose business will suffer from the bad effects of fires caused by defective wiring.

We now come to the electric-light station. Do not rent one end or the basement of a flour, saw or planing mill, and place your machinery in it and expect to get any better than the rates charged on the buildings named above. While they are considered extra hazardous risks, insurance boards in their wisdom (?) will tell you that the introduction of electric-light machinery increases the hazard and also the rate. This statement may cause you to smile, but there are those whose early experience have found it no laughing matter.

Do not place it in some old abandoned building, for, as in the above case, an increase of rates will follow. Do not set your machinery down on the ground and build a tinder box around it, for besides assuring high rates of insurance it does not speak well for the business sagacity of the owner.

Proceed as though you proposed to do a legitimate business and for all time. Build your station on solid foundation, the walls of brick or stone, not over two stories high—better only one—solid brick or stone foundations for engines, boilers, dynamos and pumps; a solid brick wall extending three feet above roof between boiler and engine room; the floor of boiler-room of brick, stone or cement; if building is two stories high have the boiler-room the same, having clear, open space between floor and roof; floors of engine-room, if dynamos are not placed therein, can be of iron or stone; if dynamos and other apparatus are in the same room, floor should be of three-inch plank, tongued and grooved, with hard-wood floor of one-inch boards, matched and laid at right angles to, or diagonally on, the plank, the whole laid on heavy square timbers or iron I-beams, the roof should be of three-inch plank, splined and grooved, resting on square, hard-wood timbers or trusses or iron or I-beams; cover this with slate, tin or gravel, according to pitch; leave the walls bare; do not attempt to improve their looks by covering them with wood and creating concealed spaces; roof and ceiling, ditto; enclose stairways with plank, and provide self-closing doors therefor; cover the doors in brick partition walls with tin; also the frames; do not build a wooden hen-coop or Turkish pagoda on top of roof, and call it a wire tower; build from floor of dynamo-room, of brick or tile, a good substantial tower, of ample size for all wires; put them in systematically and not by guess; make switchboard of good, hard, well-seasoned wood, skeleton in form, or use the sides of brick or tile tower; if slate switchboard is used, bush all holes through which wires, plugs or other connections carrying high-potential currents pass, with glass, porcelain or hard rubber; do the same if sides of brick wire tower are used; use this same material where wires pass through floors or other woodwork; secure a supply of water for protection against fire from town or city mains, if available and pressure is sufficient. In doing this have pipe leading into station of ample size. It costs no more to excavate for a six-inch pipe than it does for a one inch, and the difference in cost of pipe is not enough to outweigh the value of an abundant water supply in case of fire, for, like the Texan's revolver, then is the time when you want it and want it bad. If water cannot be secured in this way, make your boiler-pumps sufficiently large to throw, when connected together, or working singly, from three to five hundred gallons per minute, according to circumstances. Remember that all electric apparatus, including dynamos, is very susceptible to damage by fire or water, and by reducing the amount of combustible material in your plant you reduce the possibilities of a large fire and the necessity for a large amount of water.

Do not, if possible, build your station adjoining or too close to such risks as oil refineries, planing, saw and flour mills, grain elevators, etc. If obliged to do so, have no or as few openings as possible in the exposed side or end, and provide metal-covered shutters for these few. Run all your wires in plain sight, leaving ample space between them.

In planning your station allow for future growth and enlargement, without disturbing the present arrangement of machinery, etc. Store your oil, and if possible your other supplies, outside the station, and if you have a repair-shop do not have it in the second story, attic or basement. It is much better outside the building. If you must have it in the building do not box it up out of sight, but separate it, if you must, by an open partition or fence from the rest of the building.

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* Abstract of paper read at the sixteenth convention of the National Electric Light Association, held in St. Louis, February 28 and March 1 and 2, 1893.

Divest your own mind of the idea that dirt, grease and slush must be the wedded partner of an electric-light station, and impress on that of your employés that an absolute divorce must be granted if the marriage ceremony has been performed. "Cleanliness is next to Godliness," but nowhere does this maxim apply with such force as in an electric-light station.

Having finished your plant in accordance with the foregoing requirements, you need have no fears of acts of unneighborly conduct or apparent neglect of your property by the ever-active insurance agents. Instead of waiting for you to seek them out and beseech them to insure it, they will be as attentive to you as the most ardent young suitor ever was to his lady-love. Remember the so-called tariff rates and agreements that hold insurance associations together for the purpose of maintaining high rates are but ropes of sand, and that keen weapon, active and oftentimes bitter competition, is continually cutting it up in little pieces and letting this craft, that should be rightly named "Trust," drift on the hostile shore of independent action.

MORALS OF CORPORATIONS.*

BY E. A. ARMSTRONG.

The quasi-public character of much of the business of almost every electric-light company in its dealings with municipal authority must be emphasized. Every company doing such service occupies such a position of trust as to require it to give a maximum of service at a minimum of cost. Don't misunderstand me. It is not only the privilege of an electric-light company to receive, it is its duty to demand fair compensation for what it provides and furnishes. It is just as dishonest for it to take advantage of its position and crowd the municipality as it is for the municipality to reverse the tables. We have often taken occasion to complain of the unfair treatment given companies by municipalities, but too often the treatment has been invited. When a corporation such as ours makes a large investment for public lighting, and while it continues to regard what I have indicated as its duty regarding service and charges, it has the right to expect a continuance of the municipal—patronage, I was about to say—service, I will substitute. Any deviation from this, while not a violation of an express, is the violation of an implied contract; something in law just as binding when defined, and, therefore, surely ought to be in morals.

I imagine I might amplify this to a considerable extent, but I will not, further than to say what applies to corporations acting with each other and with individuals, as may hereafter be stated, will all apply, and really with more binding force, upon the relation with the municipal or governing corporation. Such a corporation being a part of the governing machinery, it is bound in law, as well as in justice, to treat with absolute fairness every person alike. It is dishonest for it to take anything for public use from its citizens at less than cost. When that is accomplished, that most undesirable of all things, municipal ownership of electric-lighting plants, will be undreamed of and unconsidered. No matter how Utopian may seem the idea of the government doing everything possible, it is the idea most foreign to our notion of government—especially the American idea. Everything possible is to be left to the people, with as little government as possible. A despot could administer the government of this country much more effectively and economically than we do by our cumbersome representative system, pervading every department as it does, assuming his honesty, good-will and ability; but it would prove far from satisfactory, to be sure. We prefer to govern ourselves, although we may not do it so well and it does cost us much more.

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It is the duty of our corporation to use the best methods it knows or can learn, adopt all the improvements, and render the best possible service, and that at as reasonable a figure as it can afford to do it, having a just appreciation of the risk the capital invested sustains, which is entitled to an adequate return. If you can furnish light or power at a less figure than you are now receiving, and still pay your stockholders a fair return, it is your bounden duty to voluntarily reduce your prices, so that those who make your business possible may have their share in your prosperity.

Don't try and find the maximum your customer will stand, but find how little you can afford to charge him, and deal with him on that basis. He will soon find it out, and it will pay you better than the other course, if that should be your highest aim. It doesn't pay to make too much money.

LONG-DISTANCE TRANSMISSION OF POWER.*

BY CHARLES S. BRADLEY.

It now lies within our means to build an electric transmission of power plant from coal-mine to city, which shall cost $300,000, and will transmit 5,000 horse-power; this plant will do the work of 30,000 men steadily day and night, year in and year out, and once placed will last a lifetime. The $300,000 represents the work of the 30,000 men for about four days, or an outlay of ten dollars each; thus these men can build a plant in four days that will do more work during their whole lives than they can. Can anything appeal to the imagination of man with more force? The energy of 5,000 horses transmitted noiselessly over a small wire, the coal from the mine placed by one act immediately beneath the boilers, the energy thence running to its destination without any labor from man.

Many are looking for the direct conversion of the energy of coal into electricity. There is no doubt that it can be done, but I fear it will never be economical, for we must depend upon the combustion of the coal in the oxygen of the air. The oxygen is just as necessary as the coal, but, being ever present, people neglect to consider how important it is. There is no other element in nature which can replace oxygen for this use. The only way we can get the energy at low cost is by the chemical combination of these two substances—coal and oxygen.

The most promising of all fields to increase the efficiency of the conversion, I believe, lies in the gas-engine; the atmospheric gas-engine of Otto Langen having reached the high efficiency of 72 per cent. In this engine the piston is allowed to shoot up by the explosion and do its work in the descent. There seem to have been mechanical difficulties in the way of the success of this machine, but these can be overcome. Then suppose we have an efficiency of .72 in an engine and 75 per cent. in transmission, we will have, all told, 54 per cent. of the energy of the coal delivered to point of consumption, which will make electrical heating not only possible but preferable to any or all other forms. Thus we may hope at no distant day to burn all coal necessary for the uses of a great city at the mine. Farther, we may take from the coal first its chemicals, which have become so valuable in the arts; then use the balance as gas in our engines.

For the electrical transmission of power we have two general systems—the alternating and direct. The multiphase alternating was advertised extensively by the Lauffen-Frankfort plant in 1891. This pioneer plant was built by much sacrifice of time and money, and we owe gratitude and honor to these men whose indefatigable efforts accomplished the beginning of an art which is destined to revolutionize the social status of mankind. This plant proved conclusively that very high voltages could be successfully used and the insulation maintained.

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*Abstract of paper read at the sixteenth convention of the National Electric Light Association, St. Louis, February 28 and March 1 and 2, 1893.

* Abstract of paper read before the National Electric Light Association at its sixteenth convention, held at St. Louis, Mo., February 28 and March 1 and 2, 1893.

The multiphase alternating is the most pliable, adjustable system that has ever been conceived. It fairly entwines itself about the electrical engineer's heart. It is capable of transformation in voltage; will supply motors of either synchronous or non-synchronous type; will readily convert in motor transformer to direct current for electric railroad or direct-current distribution, and thus supply direct-current motors. A patent was issued to me October 2, 1888, which covers this ground, and it is surprising and gratifying to read the original specification filed April 23, 1887, now nearly six years ago, and note there the complete provision for the transformation for these varied uses. At the factory of the Fort Wayne Electric Company I have had exceptional facilities for experimentation on the multiphase systems some 270 different tests having been made on motors, dynamos and transformers, the record of which fills a respectable volume. If this could be given to the world, that the engineers might know what not to do, undoubtedly the wings of many a genius would be clipped. Where the power is to be delivered in compact form the direct current offers some important advantages. We can get very high voltages by a battery of machines placed in series for the generator and motor stations. The placing of machines in series for power transmission was proposed by Mr. Edison in 1880 and Prof. Thomson in 1883. Each contributed some essential improvement, but it is evident that the enormously high voltages now contemplated were not then thought of. For the generator station I prefer compound-wound machines; first, that the system may be self-regulating; second, that the series-coil when a machine is thrown into action shall magnetize the field in the right direction; this also requires that the switch shall close the series-coil first. The shunt-coil would tend to reverse until the machine has attained electromotive force enough to overcome the resistance of its own armature. In order that each machine shall be as far as posible independent of its neighbors, I prefer that it shall be short-shunt, or in other words, the shunt-coil be charged direct from the brushes of each machine. I would use the 500-volt machines, and of such ampère capacity as the size of the plant demanded, and belt them all from one shaft. The 500 volts have been found safe to life and the commutator works well. Now, we must protect the insulation of the windings; the end machines where the terminal voltage, say, reaches 20,000 volts may, in case of grounds, be subjected to the piercing strain of the entire electrical pressure. It is impracticable to insulate the windings of each machine to stand any such potential; therefore we connect the windings of the machine at some point with the frame so that it may never be subjected to a strain greater than its own voltage; next each machine foundation is thoroughly insulated from earth, and, in case this insulation fails for any reason, the fuses of the line will be blown, thus protecting the whole structure. It is easy, however, to make this foundation insulation so perfect that no derangement will take place.

WROUGHT VERSUS CAST IRON FOR FIELD-MAGNET FRAMES.*

BY A. D. ADAMS.

The aim in this paper is to point out some of the advantages of wrought-iron over cast-iron for the field-magnet frames of bipolar dynamos.

The researches of Prof. Ewing and Dr. Hopkinson show that the same magnetizing force per unit of length, as measured in ampère turns, which produces in good hammered scrap-iron a magnetization of 100,000 lines per square inch, produces in good gray cast-iron only about 42,000 lines per square inch, and these values are about as high as we can go in either of these metals and get anything like a proportionate increase in magnetism for increase in magnetizing force.

If, then, the same number of ampère turns are to be used for a given length of magnetic circuit, cast-iron must be about two and a half times the section of wrought-iron.

Since the field-magnet, to have the same magnetic carrying capacity at the same permeability, must have about two and a half times the section when made of cast as when made of wrought iron, the weight of cast-iron for the same type and capacity of machine will be about two and a half times that of wrought.

In order to compare the relative amounts of copper required in field-magnet windings for machines of the same capacity, but with different metals in the field-magnet, the same wattage or exciting current must be assumed for all types.

Take two machines of the same type and capacity, with the same length and section of air gap between the armature-core and pole-pieces and let one field-magnet be made of wrought and the other of cast iron, throughout, each having the field-magnet core circular in section and the area of the cast-iron core two and one-half times that of wrought.

Since the ampère turns required on each magnet are equal, also the watts expended in winding, there will be the same number of turns of wire on the cast-iron as on the wrought-iron field.

As the two field-cores are circular in section and one two and a half times the area of the other, the length of wire required around the cast-iron will be to that around the wrought-iron core as $\sqrt{2\frac{1}{2}} : 1$.

Since the weight of copper required to transmit a given amount of electric energy at a given pressure and loss varies as the square of the distance, the weight of copper on the cast-iron will be to the weight of copper on the wrought-iron core as $(\sqrt{2\frac{1}{2}})^2 : 1^2 = 2\frac{1}{2} : 1$.

The general practice among American manufacturers of bipolar dynamos and motors is to use either cast-iron entirely or cast-iron yokes and pole-pieces and wrought-iron cores.

In the latter case the sections of the cast-iron parts are usually made only about one and a half times that of the wrought-iron.

With these proportions between the wrought and cast iron either an excessive amount of magnetizing force must be expended to drive the magnetism through the pole-pieces and yokes, or else the wrought-iron core must be only saturated to a very low degree.

The amount of copper or field current must be, in either case, considerably increased above that required when the cast and wrought iron parts have their correct relative proportions.

Magnetic leakage is considerably increased by the use of cast-iron, as compared with wrought-iron, by reason of the greater surface of the cast-iron, also the much higher relative degree of saturation at which it is frequently used.

It is evident from the above that the weight of iron and copper for the field-magnet and winding in a machine of given capacity are both more than twice as great when cast as when wrought iron it used entirely.

When the field-magnet is made partly of cast and partly of wrought iron, the increase of iron and copper is not so great and varies with the relative section of the cast and wrought iron parts.

The advantages of wrought iron over cast for the field-magnets of bipolar dynamos seem to be more generally appreciated in England than with us, as nearly all the leading makers of such machines there use forged wrought-iron entirely for field-magnet frames.

As the relative magnetic value of wrought and cast iron becomes more generally appreciated by dynamo builders in this country, the former will, no doubt, be much more generally adopted.

THE senate committee on patents has declined to introduce the bill prepared by the Department of Justice providing that precedence should be given by the Circuit Court for the United States for the district of Massachusetts, to the case of the United States against the American Bell Telephone Company and Emile Berliner. The attorney-general asks for the annulling of patent No. 463,569, issued to Berliner for a combine telegraph and telephone. Details of the complaint were given in our issue of February 18 last.

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* Abstract of paper read before the National Electric Light Association at its sixteenth convention, held at St. Louis, Mo., February 28 and March 1 and 2, 1893.

SOME EXPERIENCES WITH THE ALTERNATING SYSTEM.*

BY R. H. STERLING.

I will now take the principal features of an alternating station in detail, describing what have been our results and the best practice in my experience.

I will begin with the switchboard—a subject often discussed in these meetings, but none the less important—and I will try as much as possible not to go over the same beaten track, with possibly some new details. A circuit-board is eminently better made of marble, as a matter of both safety, durability and appearance, and should have plenty of space between it and the wall. The dynamo bus wires should run in horizontal rows on the back, with plug holes extending through to the front, to connect to either side of each changing switch. There is a changing switch, of course, for each feeder or circuit, and all bus wires can be connected to any particular feeder. The front of the board should be divided into perpendicular panels, each panel representing a feeder.

On the back there will be the converter for voltmeter, compensating devices, etc., and the fuse-blocks. These are preferably placed on the back, as it is an unpleasant thing to have a fuse blow in a man's face, and they should not be so high on the board that they cannot be reached standing on the floor. Many of you, undoubtedly, have had trouble with a fuse arcing, and finally melting the fuse-block into a conglomerate mass, or setting fire to the switchboard. There are two simple remedies for overcoming this; one is to have all fuses covered with a piece of asbestos paper rolled around the fuse wire or link in the form of a tube, a little larger on the inside diameter than the wire, to allow for radiation of heat, so that the fuse will not melt under its rated capacity. These asbestos tubes are very easily made, and can be pasted either with shellac or silicate of soda, which is preferable, the idea being that when a fuse is blown the pent-up gases in the tube are forced out at either end so violently that the resulting arc is dissipated immediately. I believe that I am not the originator of this idea, but believe we can claim the use of asbestos as our own, and which is the only substance that is practicable.

Another simple plan to prevent arcing is to have all fuse-blocks placed on a narrow shelf, with their faces up, as there is always a tendency in an arc to take an upward direction, owing to the current of heated air resulting from it, and in taking this direction there is a natural pulling away of the arc from the two metallic portions of the fuse-block; whereas, were it in a perpendicular position with the current usually coming in at the bottom of the block, this upward tendency of the arc only completes the path across the gap, and so continuous arcing. Fuse wire as now made is quite reliable as to its carrying capacity, but, like many other good things, is not trustworthy if abused. A lead fuse, either wire or flat link, should never be screwed down under a screw head and washer, no matter how small the carrying capacity it is intended for. This may do for a short time, but the soft metal soon loosens up, a poor contact is formed, and the fuse melts from the heat thus generated, causing no end of annoyance. This applies to fuses, no matter where they are used, all over the circuit. The one way out of this is a small flat copper terminal, slotted to slide under the screw head, and soldered to each end of the fuse wire. The carrying capacity of the wire can be stamped on one terminal. These are cheaply made.

On the front of the switchboard we have for each section or panel a volt and ampère meter for every feeder, one over the other, and surmounting these a pilot lamp run from the converter supplying the voltmeter, whose primary should be tapped on the feeder wires above the fuse-block, so that should a fuse go out quietly, as is generally the case when fuses are arranged in the manner I have mentioned, the attendant's attention will be called to the fact by the extinguishing of the pilot lamp. The changing switch, generally placed on the front of the board for each feeder, should be about breast high, so as to be easily reached to make a quick throw. I say usually placed on the front of the board, as it is only recently that a new switch has come out that has its jaws and contacts so arranged that it can be placed on the rear of the panel, with the lever extending through a slot to the front of the board. This is a matter of great safety to the switch-tender, for, as stations increase in size and load a new element of danger sometimes manifests itself in the act of throwing these changing switches. A violent arc is formed which follows across from one set of contacts to the other, throwing two dynamos in multiple through the medium of this arc, burning the attendant's face and hands, and sometimes wrecking an armature, as, of course, the two dynamos are not apt to be in synchronism when thus thrown together. Placing the switches horizontally will lessen greatly the continuance of this arc, on the same principle that I have mentioned the placing of fuse-blocks on the switchboard with their faces up, and a fibre of slate partition between the jaws will prevent the arc short-circuiting the dynamo. This annoyance is only met with on feeders of considerable length and those having a large number of converters on them. It is due to inductive discharge from converters and line, and is similar to the extra current or field discharge of a dynamo. Its occurrence depends largely upon the period in the wave phase at which the circuit is opened, and is proportional to the length of the circuit and the number of converters connected on the line. I have found this discharge to occur more frequently on circuits whose converters were partially loaded. This would naturally seem to be the result when the secondary coils of the converters were exerting no action on the primary, but I have had the most severe arcing on circuits with heavy loads. The damaging result of these arcs, however, has been entirely diminished since placing the switches horizontally, as I have described. I have spoken only of the feeder ammeters. There should, of course, be an ampèremeter for each dynamo. These are preferably placed together in a group at one end of the board, so that at a glance the attendant can see what load he is carrying, or on what dynamo there remains room for more feeders as the load comes on or goes off. The regulators and rheostats can be placed at the base of the switchboard, or, much better, if there is room, in a compact row out in front of the board about four feet, on a strong framing of wood or iron, so that all the voltmeters can be watched at the same time that the adjusting of the pressure is taking place. This saves the annoyance of the attendant jumping from the rheostat out to the front to catch a glimpse of the voltmeters to see how near he has come to guessing at the right amount of resistance he should have thrown in or out. The result will be far better service if the rheostats are thus arranged.

(To be continued.)

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* Abstract of paper read before the National Electric Light Association at its sixteenth convention, held at St. Louis, Mo., February 28 and March 1 and 2, 1893.

THE "VULCANIZING" PROCESS FOR PRESERVING AND STRENGTHENING POLES, CROSS-ARMS, TIES, ETC.*

BY HARRY C. MYERS, PH.D., F.C.S., ETC.

When we consider that the annual consumption of timber in this country equals twice the amount of material supplied by the annual growth of our forests, it is apparent that the subject of wood preservation, wood strengthening and the utilizing of certain woods now considered as worthless, is a most important and vital one.

Wood as it occurs in nature consists of cellulose impregnated with resin, volatile oils, sugar, gum, tannin, protein bodies and the usual mineral constituents of plants. The percentage of these various constituents, of course, depends not only upon the kind of wood, but upon the season of year, locality, nature of the soil, and part of the tree from which any given sample is taken, hence any results or tests would be only approximate ones.

When wood is heated, as in ordinary wood distillation, the cellulose decomposes and a chemical change takes place between it and the natural constituents of the sap, resulting in a most powerful antiseptic mixture containing acetic acid, methyl alcohol, acetone, methyl acetate, tarry matter containing phenol, creosote, carbolic acid and about thirty other chemicals of lesser practical importance.

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It must be borne in mind that these chemicals and antiseptics result from the action of *heat* on the natural sap of the wood, and are *entirely different* from the original sap which allows of the attacks of microscopic fungi and decay. Why has it occurred to no one to heat timber at a temperature which would produce the above change, and then to *keep the changed antiseptic mixture there under pressure*, instead of distilling it *out* of the wood? Such is the entirely new and original process known as "wood vulcanizing," viz., the heating of wood and timber under great pressure.

In the process of "vulcanizing," wood is heated in closed cylinders from eight to twelve hours at a temperature ranging from 300 degrees to 500 degrees Fahrenheit and under a pressure of from 150 to 200 pounds to the square inch. A circulation of superheated and dried compressed air removes the surface moisture and any water that does not take part in the reaction and combine with the woody constituents. Hence, wood or timber, in any condition, may be immediately treated. These cylinders for the treatment are 105 feet long, 6½ feet in diameter and are made of steel. As the treatment penetrates to the heart of the timber, considerable time is required for cooling, which is, of course, done in the cylinder and under pressure. Timber is introduced and treated upon cars which run into the cylinder upon small tracks.

This process apparently makes decay impossible by sealing up the pores of the wood with antiseptic matter which becomes solid and firm on cooling and standing, and which is produced *within* the wood by the action of heat and pressure upon its original sap.

The life of vulcanized timber is not known; none of the timber or ties used in railway construction during the past ten years have been known to decay. I personally examined some 12 x 12 pine timber which had been placed in a machine-shop in 1882, part being vulcanized and part untreated. The treated timber is perfectly sound and still in use, while the untreated had completely rotted and crumbled away after five years' use. I also find by personal investigation that timber placed on the Manhattan Elevated Roads of New York city, as far back as 1883, shows no signs of decay, and is as sound and sweet as if fresh from the tree, while untreated timber laid at the same time has rotted away and been replaced.

As vulcanizing changes the sap from the liquid to the solid or semi-solid state, does not char or make the wood brittle, saturates and seals up the pores of timber with solid matter instead of liquid soluble matter which nature provides, considerable strength and durability are added by vulcanizing, the wood being rendered more cohesive, harder and denser. The spike-holding quality is naturally much increased, and even after ten years' service, railroad spikes seem to be as firmly imbedded as when just driven.

It is also a curious fact that the electrical resistance of most woods is very greatly increased by vulcanizing.

THE EXHIBITS.

(*By Telegraph to the Electrical Age.*)

ST. LOUIS, MO., MARCH 1. There is a large number of exhibits here, and they are, in the main, extensive ones.

THE BRYANT ELECTRIC CO., of Bridgeport, Conn., was represented by Mr. W. C. Bryant, of Bridgeport, and Thos. G. Grier, of Chicago. These gentlemen had a sample-board containing specialties, Bryant and Paiste switches, sockets, K. W. cut-outs and specialties, Cleveland switch and arc-light cut-outs, china switches, etc.

MR. GEORGE CUTTER, of Chicago, was represented by Mr. Cutter himself and H. J. Hadaway. He exhibited electrical specialties and a full line of porcelain goods.

THE ELECTRICAL CONSTRUCTION AND SUPPLY COMPANY, of New York, was represented by R. B. Corey and J. C. Knight, and exhibited "Ward" arc lamps of the Byzantine and New Tile patterns, which were universally admired.

C. A. SCHIEREN & CO., of New York, had a 72-inch 3-ply belt, 113 feet long, made for the World's Fair, and intended to run a 1,000 horse-power Westinghouse generator. The firm was represented by E. P. Atkinson, of New York, and A. W. Harvey, of Chicago.

THE GENERAL INCANDESCENT ARC LIGHT COMPANY, of New York, was represented by Augustus Noll, J. W. Schroeder and E. Webster, who had on exhibition 4 plain arc lamps, 8 fancy lamps of different designs, and 2 Bijou's of 200 candle-power, together with cuts of various other styles of lamps.

THE CHARLES E. GREGORY COMPANY exhibited a line of arc-light apparatus, double-pole switches, wire-tightening ceiling-boards and Pfluger arc-lamp hangers. The company was represented by Mr. Gregory.

THE STANDARD ELECTRIC COMPANY, of Chicago, was represented by Mr. H. D. Perry, who showed single and double carbon arc lamps, and automatic arc-lamp hangers for street use in difficult places, allowing the lamps to be cut in and out of circuit without breaking the circuit.

THE OKONITE COMPANY, of New York, was represented by Mr. George T. Manson and its Chicago and St. Louis agents.

THE ELECTRICAL APPLIANCE COMPANY, of Chicago, and the India Rubber and Insulated Wire Company, of Jonesboro, Ind., had an exhibition of their goods in one of the parlors of the hotel.

THE ELECTRICAL ENGINEERING AND SUPPLY COMPANY, of Syracuse, N. Y., displayed various samples of its well-known goods in one of the parlors of the hotel.

THE CUTTER ELECTRICAL AND MANUFACTURING COMPANY, of Philadelphia, was represented by Mr. H. B. Cutter. Mr. Cutter exhibited a C-S flush switch, double pole, single pole and three wire; a C-S flush double-push commutation switch, for three and four wires; a C-S flush key switch, double pole, single pole and three wire; a C-S flush automatic switch, single pole; and a C-S flush commutation switch for three wires and four wires, with a capacity of 10 ampères.

THE FALLS RIVET AND MACHINE COMPANY, of Cuyahoga Falls, O., occupied a parlor.

THE ELECTRIC SELECTOR AND SIGNAL COMPANY, of New York, was represented by Mr. C. P. MacKie and Herbert Laws Webb. This company had a notable exhibit, consisting of one C. & C. generating plant and a series of six groups of incandescent lamps, Lundell motors and several arc lamps on the Fourth street commercial circuit of the Municipal Light and Power Company. All of the electric fixtures, lamps and motors being controlled by the central-station transmitters located in the company's parlor. By means of these instruments any one of the series could be thrown in or out of circuit as desired, without affecting any of the other lamps or apparatus in the same circuit. This was a most complete exhibit.

MR. FRANK A. MAGEE and MR. H. G. ISSERTEL represented the E. S. Greeley & Company, of New York.

THE FORT WAYNE ELECTRIC COMPANY, of Fort Wayne, Ind., was represented by C. R. Knight, E. T. Pardee and W. J. Morrison. A constant-potential and alternating arc lamp comprised their exhibit. These gentlemen kept open house and entertained their many callers very hospitably.

THE CONSOLIDATED ELECTRIC MANUFACTURING COMPANY, of Boston, was represented by Mr. C. E. Bibber, who exhibited a sample of the popular Lyon brake handle, which is meeting with great favor among street-railway companies and is now used on 60 electric roads. Mr. Bibber has already received 300 orders in St. Louis for these handles. He also showed large drawings of his company's arc-light system, which has been adopted in several western towns. He gave away as souvenirs celluloid game counters.

The W. S. Hill Electric Company, of Boston, had a full line of switches, including a self-locking and starting switch.

The Carpenter Enamel Rheostat Company, of Bridgeport, Conn., displayed samples of enamelled goods. C. E. Carpenter and C. D. Shain represented the company.

James J. Murray & Co., of Philadelphia, represented by J. K. Martin, displayed a full line of electric incandescent shades in all different styles of opal and opalescent, colored, etched and rich cut, and arc globes to fit lights of all systems.

W. Jessup & Sons, of Sheffield, England, were represented by Mr. Ezra H. Linley. Jessup steel for the manufacture of fine tools has become essential, and circulars setting forth the merit of this metal were liberally scattered in the main lobby of the hotel.

Abendroth & Root Manufacturing Company, of New York, manufacturers of the Root safety sectional boilers, so extensively used in electric-light stations, distributed some elegantly prepared catalogues of these boilers and spiral riveted pipes. We notice that the supply was rapidly exhausted.

C. W. Hunt Company, of New York, distributed a brochure on the Hunt system of industrial railways. This system involves the handling of materials economically and is an interesting one to all manufacturers, central electric-light stations, operators included. A study of this little work impresses one with the great advantages possessed by the system.

A. Wyckoff & Sons furnished their representatives with some neatly printed literature concerning their specialties in patent wood water-pipes and patent steam-pipe casing. The merits of these goods are emphasized by the extensive sales they meet with. Wood and paper being excellent non-conductors of heat, these specialties are said to have no equal in their line.

Mr. James W. Godfrey, general manager of the New York Insulated Wire Company, manufacturer of the celebrated Grimshaw white core wires, vulca ducts, etc., was on hand as usual and as lively as ever.

The Fishkill Landing Machine Co., Fishkill-on-the-Hudson, was represented by circulars plentifully distributed in the main corridor of the hotel. This company is the manufacturer of the Fishkill Corliss engine, which has long been a favorite among electric-station men on account of its high economy, close regulation and noiseless operation.

The Blakeslee Mfg. Co., of Duquoin, Ill., was represented by Mr. A. H. Blakeslee, the junior member of the concern. The Blakeslee steam-pump takes the lead in this part of the country for use in electric-light stations. Its simplicity and durability are acknowledged, and it fills every situation where a good steam-pump is desirable. The St. Louis branch of this company is at 13 South Fourth street.

The Weston Electrical Instrument Co., of Newark, N. J., have one of the most interesting exhibits of the convention. Its voltmeters, ammeters and milliammeters were the admiration of every one present. Mr. Edward Weston and Prof. Richard O. Heinrich extended a cordial welcome to everybody.

The Eureka Tempered Copper Co., of North East Pa., Mr. John B. Coffmann representative, exhibited samples of sheet copper of all gauges and widths and sheet metal commutator brushes for all arc-light systems.

The General Electric Co. used the plant of the Southern Hotel for exhibition purposes. This plant operates 50 arc and 500 incandescent lamps. James McKearney is the engineer.

The Eddy Electric Manufacturing Company, of Windsor, Conn., was represented by A. D. Newton and M. E. Baird. It had on exhibition a 15 horse-power motor.

The Hart & Hageman Manufacturing Company, of Hartford, Conn., exhibited some samples of Hart switches and Sperry fuses and links. The company was represented by Mr. George S. Searing.

The Missouri Electrical Repair Company, 16 South Ninth street, St. Louis, of which E. B. Tyler is manager, is meeting with big success in rewinding armatures, refilling commutators and general electrical repair work. The company is constantly crowded to keep up with its orders. The company's exhibit consisted of a complete armature for a 12 kilowatt Edison dynamo, also shunt spools for various makes of arc lamps. This company is also agent for the Eureka Tempered Copper Company, of North East, Pa.

NOTES.

(*By Telegraph to the Electrical Age.*)

Mr. Charles D. Shain on behalf of the association presented an elegant varicolored scarf to Mr R. B. Corey, of "Ward" arc-lamp fame.

Mr. E. Ward Wilkins was on hand representing the Partrick & Carter Company, of Philadelphia.

Mr. C. O. Baker, Jr., master of transportation, was presented with a solid silver punch-bowl by his friends in recognition of his uniform courtesy on this and previous similar occasions.

Mr. D. C. Spruance, of the Helios Electric Company, of Philadelphia, sold 180 Helios alternating-arc lamps in St. Louis. One of these lamps was in use at the Electric Club and attracted considerable attention.

Mr. J. C. Perriez, of New York, represented the Goodrich Hard Rubber Company, of Akron, O., and did a good business with buyers of hard-rubber goods. He returned home loaded down with orders.

"General" J. W. Godfrey, the Grimshaw giant, gathered in lots of orders.

Our genial friend, Mr. R. B. Corey, was one of the lions and giants, combined, at the convention. He oblained a large number of orders for his "Ward" arc tamps, for direct and alternating currents.

The Shultz Belting Company was ably represented by Mr. J. A. J. Shultz, the president, and Mr. A. B. Laurence, the New York manager.

Mr. J. H. Mason, of the Simplex Company, Boston, was met and stated that over 1,200 miles of Simplex wire was used in St. Louis for light and power purposes.

The Laclede Carbon and Electric Company, of which Mr. P. C. Burns is manager, received a large number of orders for its goods during the convention.

Mr. Benjamin R. Western, of the Manufacturers' Advertising Bureau, New York, made a number of new friends and industriously circulated an immense amount of printed matter for his clients.

The friends of Secretary George F. Porter presented him with an elegant gold watch and chain.

It is reported that a syndicate of New York and Philadelphia capitalists has secured control of the Newark Electric Lighting Co., of Newark, N. J. The object is to utilize the electric-light station for the generation of power for the electric railroad system of Newark.

THE ST. LOUIS CONVENTION.

(*Continued from page* 136.)

the committee on relations with the parent companies. The election of officers for the ensuing year was then announced as follows: President, Judge E. A. Armstrong; 1st vice-president, M. J. Francisco; 2d vice-president, C. H. Wilmerding. Members of the executive committee, E. F. Peck, A. J. De Camp, W. J. Morrison, G. H. Blaxter.

The place and time of the next meeting was left for the executive committee to decide upon. The convention then adjourned.

TESLA'S LECTURE.

(*By Telegraph to the Electrical Age.*)

ST. LOUIS, MO., MARCH 1.—Nikola Tesla's lecture and electrical exhibition at the Exposition Building to-night was a brilliant success. There were about 5,000 people present and the large hall was literally packed. The apparatus used in the experiments was capable of producing, he said, an electrostatic force of from 200,000 to 300,000 volts. A small apparatus especially devised for showing the electrostatic force was attached to the large machine, and Mr. Tesla, taking a pair of pliers, grasped the wire. The house was darkened and electric sparks could be seen to dart from his finger-tips. Some novel feats of dynamic electricity were then shown. Mr. Tesla showed that incandescent lighting could be done with one wire, using first an ordinary electric lamp then a bulb with a piece of carbon in it.

Two copper bars with a cross-piece were placed on the stand and small bulbs suspended between them. Then the current was turned on and Tesla said the atoms of the wire had to vibrate from 2,000,000 to 3,000,000 times per second to produce the light. The experiment was successful and a number of similar ones were shown. He then said that in his opinion energy could be transmitted through the air without a wire by means of a powerful machine properly located. He next showed that the high resistance of the filament of a lamp was not necessary to produce light, using for the purpose two 50-volt lamps, one with and one without a vacuum. The one without was the brighter of the two. Tesla next took a little bulb which he said was painted on the inside with a chemical and grasping the wire with a pair of pliers the current of 200,000 volts was allowed to pass through his body and the bulb held in the other hand was illuminated. Startling as this was he next took a long glass tube which he illuminated in the same manner, swinging it over his head and twining it around with his fingers. He said the light was produced by the incandescence of the rarefied gas in the tube.

He then produced a glow of light between two discs without using any wires. His last experiment was to make the current pass in waves of light across the bench and then through his body, illuminating two glass tubes he held in his hands.

He was loudly applauded and given a perfect ovation at the close of the lecture by the vast audience.

ENTERTAINMENTS.

(*By Telegraph to the Electrical Age.*)

ST. LOUIS, MO., FEBRUARY 28.—After the adjournment of the morning session about 200 of the delegates repaired to the rooms of the St. Louis Electric Club, where an elaborate lunch was provided for them, and they were received in a most hospitable manner. The tables were elaborately decorated and the menu was varied and ample. The delegates asserted that nowhere had they been more handsomely entertained. Supper as well as dinner was served. The Electric Club bunched a lot of lights in front of its parlors and the effect was charming. Locust street, which is usually a dark thoroughfare in that region, was as bright as day.

The visit of the delegates to the different local central stations of electric lighting proved undoubtedly the most interesting feature of the entire convention from a practical point of view.

All the lectures and scientific discussions, good as they are, cannot make the same impression on the central-station man as going around the different stations, inspecting the different plants, the various systems, the apparatus, their construction, operation, etc. In this respect St. Louis is a place particularly suited for such a test of comparison, for the simple reason that every known system of electric-lighting apparatus is represented here. That the delegates appreciated this fact and that they thoroughly enjoyed their trip became soon manifest after they had all returned to the Southern Hotel, because this visit and its impressions were the subjects of conversation throughout the evening. In this respect one thing became very patent to the observer, and that was that this tour of inspection elicited the general verdict that the plant of the Missouri Electric Light and Power Company, the plant which is operated on the Westinghouse system, carries off the palm of superiority in every manner. A number of the delegates were interviewed as to their opinion of the different plants and different systems of electric-lighting in this city, and the trend of all their remarks were praise for the Missouri plant, praise for the men who run it, and praise for the Westinghouse apparatus.

THE ATTENDANCE.

(*By Telegraph to the Electrical Age.*)

NEW YORK. H. C. Adams, P. C. Ackerman, C. O. Baker, Jr., A. H. Bauer, Louis Cassier, R. B. Corey, F. R. Colvin, B. E. Greene, H. M. Haines, W. J. Hammer, E. B. Hatch, M. M. Hayden, E. J. Hall, Jr., Henry G. Issertel, George J. Jackson, W. J. Johnston, W. S. Key, J. C. Knight, A. B. Laurence, E. W. Little, Romaine Mace, George T. Manson, Mrs. Manson, John J. Moore, Edward B. McClees, F. A. Magee, J. D. Miller, P. W. Mitchell, T. C. Martin, H. C. Myers, J. P. McQuaide, Augustus Noll, W. F. Osborne, Nelson W. Perry, George F. Porter, C. W. Price, H. T. Richards, John A. Seely, E. W. Seymour, C. D. Shain, C. E. Stump, H. J. Smith, H. M. Swetland, J. B. Taltavall, Nikola Tesla, Herbert Laws Webb, B. R. Western, Fremont Wilson, E. E. Wood, W. T. Hunt.

CHICAGO. E. P. Atkinson, George C. Bailey, W. D. Ball, Col. Geo. L. Beetle, C. E. Brown, M. J. Bulkley, E. W. Buss, John R. Coffman, A. B. Conover, J. F. Conner, L. W. Collins, W. F. Collins, E. A. Cummings, George Cutter, F. E. Degenhardt, Fred. Deland, J. W. Dickerson, F. E. Drake, E. W. Goldsmith, C. E. Gregory, Thos. M. Grier, D. E. Goe, Mrs. Moshier, T. Greene, J. F. Kester, Ernest L. Clark, Edward Stockwell, Wells Goodhue, C. E. Wilson, P. H. Hoover, H. S. Manning, W. C. McKinlock, W. H. McKinlock, S. F. B. Morse, J. A. Mosher, D. H. Ogden, J. B. O'Hara, Charles T. Page, E. L. Powers, D. P. Perry, C. L. Reiman, J. Scribner, E. F. Seixas, George S. Searing, A. M. Searles, H. H. Small, Thos. S. Stacy, M. J. Sullivan, F. S. Terry, C. H. Wilson, Chas. Wirt, John Vallentine, A. W. Harvey, M. M. Wood, H. I. Hidaway, Jas. M. McKearney.

CAMDEN, N. J. Hon. E. A. Armstrong, John J. Burleigh.

ST. LOUIS, MO. Dr. Wellington Adams, T. N. Ambler, Jas. I. Ayer, P. C. Burns, S. G. Booker, F. A. Churchill, Jr., A. W. Dutton, H. Elliott, Jr., J. R. Ferguson, W. L. Flower, J. F. Gerleman, J. H. Hopkins, W. N. Matthews, Louis Nahm, Prof. Nipher, A. Partridge, P. N. Rose, F. Schlosser, R. V. Scudder, George C. Stedman, A. C. Thompson, C. G. Woods, Capt. J. A. J. Shultz, C. H. Talmage.

Philadelphia, Pa. C. A. Bragg, H. B. Cutter, A. J Decamp, W. S. Horry, A. W. Manwaring, A. J. Martin, John K. Martin, James A. Pentz, T. Carpenter Smith, E. Ward Wilkins.

Cincinnati, Ohio. P. A. Clisdell, C. E. Jones, Robb Mac Kie, R. J. Randolph, Charles J. Foust, T. J. Ryan, R. S. Steanes, John Turner, J. W. Wilshire, I. L. Meloon, G. B. Edgar.

Boston, Mass. Dr. Louis Bell, C. S. Haley, Charles I. Hills, George F. Talcott, H. H. Brooks, Capt. Wm. Brophy, Benjamin Taft, J. H. Mason, Rob't B. Tabor, Matt M. Merritt, Charles E. Bibber, Addison C. Sargent, D. F. Urquhart.

Pittsburg, Pa. H. H. McDuffie, Alex. J. Wurts, J. S. Crider, E. H. Heinrich, Morris W. Mead, E. E. Little, G. H. Blaxter, L. B. Stillwell, F. Moore, H. McGonigle, J. W. Marsh.

Brooklyn, N. Y. T. E. Crossman, James Ferjuson, Frank C. Mason, E. F. Peck.

Cleveland, Ohio. W. B. Cleveland, F. A. Lane, Fred. A. Scheffler.

Indianapolis, Ind. A. D. Adams, C. D. Jenney, George C. Pyle.

Kansas City, Mo. George M. Myers, Leo. H. Camp, C. A. Ross, Thos. F. Clohesey.

Newark, N. J. R. C. Heinrich, Wilson S. Howell, C. McIntire, Edward Weston.

Pittsfield, Mass. Henry Hill, John Hoover, A. Taylor.

Rochester, N. Y. G. A. Redman.

Cuyahoga Falls, Ohio. C. A. Babcock, R. S. Willard, E. L. Babcock.

Des Moines, Ia. J. A. Colby, C. K. Mead.

Montreal, Que. A. J. Corriveau.

Allegheny, Pa. D. Hunter, Jr.

Altoona, Pa. W. H. Markland.

Anniston, Ala. Howard W. Sexton.

Baltimore, Md. H. C. Tudor.

Battle Creek, Mich. J. B. Foote.

Birmingham, Conn. Rob't E. Wyant.

Bridgeport, Conn. W. C. Bryant, C. E. Carpenter.

Buffalo, N. Y. R. J. Getz.

Canon City, Col. P. B. Scates.

Carthage, Mo. S. E. Whitehead.

Chanute, Kan. Wm. J. Bailey.

Colorado Springs, Col. E. E. Wade.

Cedar Rapids, Iowa. W. J. Greene.

Davenport, Iowa. C. W. Grant.

Dayton, Ohio. W. H. Ashton.

Dallas, Texas. D. M. Clover.

Denver, Col. E. W. Rollins, P. H. Sterling.

Eau Claire, Wis. Frank S. Culver.

Fort Wayne, Ind. Chas. S. Bradley.

Galesburg, Ill. Edwin L. Larkin.

Hartford, Conn. E. B. Hatch, C. E. Newton.

Houghton, Mich. J. R. Dee.

Jackson, Mich. W. A. Foote.

Janesville, Wis. P. Norcross.

Jonesboro, Ind. C. J. Butler.

Kenosha, Wis. T. S. Boardman.

Lockport, N. Y. R. S. Bishop.

Louisville, Ky. Campbell Scott.

London, England. Prof. Geo. Forbes, Vivian Hawkon.

Memphis, Tenn. W. W. Carnes.

Milwaukee, Wis. S. G. Coleman.

Minneapolis, Minn. Edwin S. Tice.

New Brunswick, N. J. A. J. Jones.

New Britain, Conn. L. C. Whitney.

New Orleans, La. Wm. Oswold.

Norwich, Conn. Geo. J. Jackson.

Omaha, Neb. M. J. Cowgill, F. J. Pearson.

Peru, Ind. J. Horr.

Racine, Wis. P. H. Korst.

Rensseler, Ind. W. B. Austin.

Roodhouse, Ill. E. H. Higbee, Jr.

Rockford, Ill. Geo. Mayo, W. B. Roberts.

Rutland, Vt. M. J. Francisco.

Seattle, Wash. Dr. E. C. Kilbourne.

Sewickley, Pa. E. P. Young.

St. Joseph, Mich. W. Worth Bean.

Steubenville, Ohio. J. G. Gwynne, Thos. Johnson.

St. Joseph, Mo. I. F. Dyer, J. H. Parker.

St. Paul, Minn. John A. Berkey.

Springfield, Ohio. J. H. Miller.

Syracuse, N. Y. W. J. Morrison, E. T. Pardee.

Toledo, Ohio. John J. Moore.

Toronto, Ont. J. H. Quinlan, Frederic Nicholls.

Troy, N. Y. E. G. Bernard.

Washington, D. C. F. W. Royce.

Washington Court-House, Ohio. Jerome Penn.

Warren, Ohio. W. D. Packard.

Waterbury, Conn. J. O. Crane.

Worcester, Mass. H. H. Fairbanks.

Windsor, Conn. M. E. Baird, A. D. Newton.

Vandalia, Ill. D. M. Clark.

Vincennes, Ind. H. W. Frund.

LADIES.

Mrs. Louis Cassier, New York.
Mrs. George T. Manson, New York.
Miss Annie E. Fortiner, Chicago.
Mrs. Moshier T. Greene, Chicago.
Mrs. W. H. McKinlock, Chicago.
Mrs. D. N. Ogden, Chicago.
Mrs. A. J. Decamp, Philadelphia.
Miss Decamp, Philadelphia.
Mrs. A. W. Manwaring, Philadelphia.
Mrs. Geo. M. Myers, Kansas City, Mo.
Mrs. Willard, Cuyahoga Falls, Ohio.
Mrs. C. W. Grant, Davenport, Iowa.
Mrs. P. Norcross, Janesville, Wis.
Mrs. W. B. Austin, Rensseler, Ind.
Mrs. M. J. Francisco, Rutland, Vt.

MUSIC FROM NEW YORK TO CHICAGO BY TELEPHONE.

An interesting event took place in the telephone company's building, 18 Cortlandt street, New York city, on Monday, February 27. At 5 P.M., between 50 and 75 people, about one-half the number being ladies, were assembled in Room 9 to witness a test of the ability of the long-distance telephone to transmit instrumental and vocal music from New York to Chicago.

The object of this affair was an interesting one. Miss Minnie Wetzler, piano soloist of the Boston Symphony Company, is favorably regarded by Mr. Theodore Thomas, the celebrated musical leader, in connection with a leading position in the musical arrangements during the World's Fair at Chicago. Mr. Thomas is at present in Chicago and his duties were so pressing that he could not come east to test Miss Wetzler's ability and skill, and Miss Wetzler was unable to proceed to Chicago to be tested for similar reasons. It was therefore arranged that Miss Wetzler should come to New York and play, the notes to be conveyed to Mr. Thomas' ears in Chicago by long-distance telephone.

A Steinway grand piano was placed in the room for this occasion and about 10 feet removed from it was a huge funnel with the large end towards the piano, a telephone transmitter being attached to the smaller end. On a table in one corner of the room were placed various electrical measuring and other instruments, over which a close watch was kept during the performance to note the course of events from a scientific standpoint.

At 5:05 o'clock Miss Wetzler sat down to the piano and gave two selections, primarily for the benefit of Mr. Thomas, who was sitting over a thousand miles away listening with deep interest. Mr. Thomas, however, being invisible to the party in New York, was forgotten for the time being, and those present were mentally carried away with the exquisite performance.

Mr. Plunket Greene, an English singer, then sang a German song into the big funnel, and followed it with an Irish melody.

Next a piano solo was played by Mr. Hermann Wetzler, and Miss Wetzler followed him with another selection. After this two cornet solos were played at Chicago for the benefit of the New York party. Several receivers were connected and those present took turns at listening to the soft strains as they came in from their long journey. Every note was distinct, and the music did not seem to have lost any of its charm during its long and rapid flight.

A luncheon was then served, after which Mr. Greene gave another song for the benefit of his New York and Chicago audiences.

Between each part Mr. Thomas was communicated with verbally, and during these talks he expressed himself as well pleased with the manner in which the music reached him. He stated that the piano's notes came with much distinctness, so much so that he had been enabled to form an opinion there and then as to Miss Wetzler's abilities. His decision, however, would be communicated to that lady by mail. Considerable conversation was indulged in by different ones of the party with Mr. Thomas, and they all talked as easily and freely as though Mr. Thomas was just across the room.

In order to give those present an idea as to how music sounds after travelling over a long-distance telephone, two Boston wires were then connected into a loop. The end of the loop was connected with receivers in another room on the same floor—but far enough away so that the notes of the piano could not be heard through the air—and Miss Wetzler played on the piano. The notes came back with wonderful distinctness, and all were delighted with the test.

The party then dispersed, greatly pleased with the novel entertainment, and the telephone managers were congratulated on the great success of the test. Mr. F. A. Pickernell, the company's electrical engineer, had charge of all the arrangements, which were so successfully carried out.

AMERICAN STREET RAILWAY ASSOCIATION.

Secretary Wm. J. Richardson, of the American Street Railway Association, has sent us a list of the titles of subjects and assignments thereof on which special reports will be prepared at the next annual meeting of the association. The following is a copy of the list:

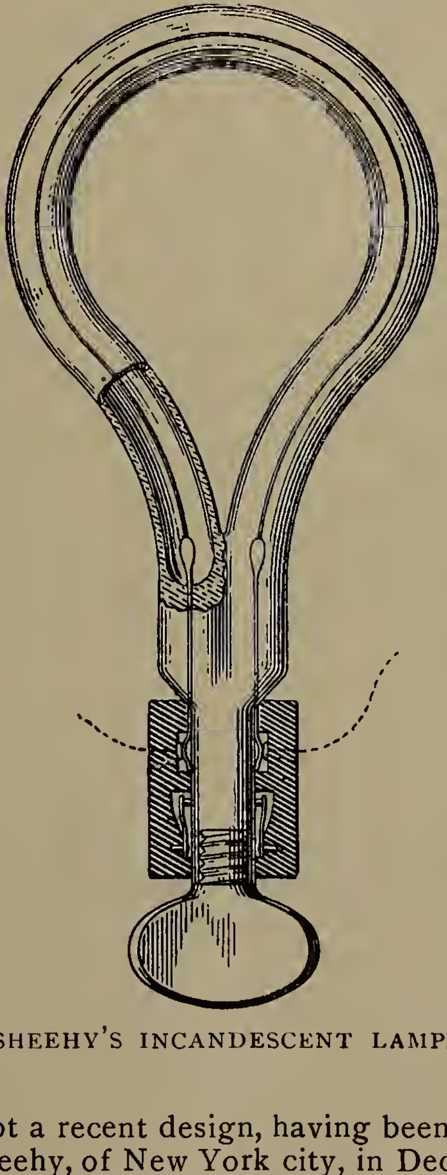
1. Best Method of Lighting and Heating Street Railway Cars. G. F. Greenwood, general manager, Pittsburg, Alleghany and Manchester Traction Co., Pittsburg, Pa.
2. Can the T-Rail be Satisfactorily Used in Paved Streets? C. Densmore Wyman, vice-president, Central Park, North and East River R. R., New York city, N. Y.
3. Direct-Driven Generators. C. J. Field, electrical engineer, New Jersey Traction Co., Newark, N. J.
4. Power-House Engines. E. G. Connette, superintendent, United Electric Railway, Nashville, Tenn.; L. H. McIntire, electrical engineer, Atlantic Ave. R. R. Co., Brooklyn, N. Y.; F. S. Pearson, electrical superintendent, West End R. R. Co., Boston, Mass.
5. Standards for Electric Street Railways. O. T. Crosby, Boston, Mass.; Charles W. Wason, Cleveland, Ohio; L. H. McIntire, Brooklyn, N. Y.; Thos. H. McLean, New York city; C. G. Goodrich, Minneapolis, Minn.
6. Storage Batteries in Connection with Central Stations for Utilizing Surplus Energy for Lighting or Power. C. O. Mailloux, electrical engineer, Metropolitan R. R. Co., Washington, D. C.

The next meeting of the association will be held in Milwaukee, Wis., third Wednesday in October.

NOVEL FORM OF INCANDESCENT LAMPS.

In incandescent lamps, as in all other devices, there is always room for improvement of some kind, as, for instance, in the former the quality of the filament; its shape, as well as the form of the chamber that contains it; also in the means employed for attaching the lamps to the fixtures or holders.

The accompanying illustration shows an incandescent lamp and holder which is a radical departure both in form and arrangement for bringing it in and out of circuit. It is not a recent design, having been patented by Robert J. Sheehy, of New York city, in December, 1883.


SHEEHY'S INCANDESCENT LAMP.

The filament of this lamp is preferably formed in the shape of a circle, the tube being bent to conform to such shape, so that when the filament is inserted and the glass moulded around the metallic conductors it (the filament) will be coincident throughout its entire length with the axial line of the tube. When very long, flexible filaments are used they are either tied to the tube or supported by small carbon washers or supports which fit the tube. The metallic conductors to which the filament is attached pass through the glass and are secured to the ground glass stem or neck in such a manner that they can be used as contact-pieces. The supply wires are so arranged that the turning of the lamp one-quarter of its circle brings it in or out of contact with them; thus in one complete revolution of the lamp it would be brought in and out of circuit twice. The socket is made of glass, porcelain, or other non-fibrous insulating material, and the ends of the supply wires are given sufficient spring to make good contact with the lamp wires. To insure proper position of the lamp small indentations are made in the neck or stem into which the springs secured to the socket drop and hold the lamp in the desired position.

The features of advantage claimed for this form of lamp are increased illuminating capacity (it being well known that where the entire filament is encased in a globe or bulb the highest efficiency is not obtained, and especially where both sides of the loop are close together in the centre of the globe, the wider the loop and nearer the glass the better is the general illumination), indestructibility of the socket or holder, cheapness of construction and beauty of design. The filament is enclosed in a glass tube so small in diameter that when it is heated to incandescence it is not distinguishable from the tube, the latter itself appearing as a luminous body its entire length, and being round acts as a lens emitting light in all directions. This feature very materially increases the illuminating capacity of the lamp, consequently its efficiency. On this principle a good, efficient and reliable lamp can be produced *without creating a vacuum* in the tube. Arrangements are being made for their manufacture in large quantities.

THE NEW WESTINGHOUSE LAMP.

A press despatch from Pittsburg, Pa., on February 23 states that in the case of the General Electric Company against the Westinghouse Electric and Manufacturing Company, under proceedings by the latter company for the purpose of determining the right to manufacture the stopper lamp, Judge Acheson read an opinion on that date to the effect that the question was not one to be determined on a motion for a preliminary injunction on *ex parte* affidavits at the request of the defendants, but that the difference in the construction of the lamp is such that a decision should only follow a final hearing after the taking of testimony in the usual manner and after trial.

OBITUARY.

Mr. Geo. B. Ellery, Financial Editor of the Electrical Age, died at his home in Brooklyn on February 25 last. All through his sickness and while lying on his back in his sick bed he kept in touch with the outside world of activity, and his weekly contributions to the columns of the Electrical Age came with absolute regularity. With wonderful grit he wrote his financial articles while on his bed of suffering, and they contained not one word that betrayed any physical or mental pain. They were always sparkling and full of hope.

The Rockland and Thomaston Gas Light Company, the Camden and Rockport Electric Light Company and the Thomaston and Warren Electric Light and Power Company (Maine) have consolidated and will be known as the Knox Gas and Electric Company. The capital stock of the company is $200,000 and it will supply gas and electricity to Rockland, Warren, Camden, Thomaston and Rockport. The directors are: George E. Macomber, J. Manchester Haynes, H. L. Shepard, E. K. O'Brien, William T. White, William T. Cobb and Sidney M. Bird. Officers: President, George Macomber; treasurer, A. D. Bird.

NOTES OF GENERAL INTEREST.

A project is on foot in San Francisco, Cal., to construct an electric-lighting plant to compete with the Edison plant.

Bids for the long-distance power transmission plant from Folsom to Sacramento will be received for several weeks yet by the Folsom (Cal.) Electric Light and Power Company.

An electric smelting plant is proposed for Tacoma, Wash. The process of Professor Benson of Chicago is to be used. W. F. Fife of that place is interested in the project.

A special election was held at Monett, Mo., and Colonel H. Ward Hicks has been granted a franchise for supplying electric light and power.

In the suit brought against the Hancock Electric Light and Power Company, Findlay, O., by the Findlay Electric Light Company, attacking the franchise of the former on the ground that it had not been submitted to the vote of the people, a verdict has been rendered in favor of the Hancock Electric Light and Power Company.

The Merchants' Co-operative Electric Light Company, of Armourdale, Mo., has asked for a franchise to erect an electric-light plant in that town.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, Feb. 25, 1893.

During the month of January 88 poles were cut down and 104 miles of wire removed as obstructions in this city under the supervision of the Board of Electrical Control.

The United States Electric Light and Power Company has suffered the loss of over a mile of copper wire since February 17 in the down-town streets. The wire was removed from poles and under the elevated railway structures, it is thought, by unemployed linemen. A policeman noticed one of the thieves at work among the wires, but supposed he was a regular lineman and took no action in the matter. The authorities are now on the lookout for the wire thieves.

The annual meeting of the Consolidated Telegraph and Electrical Subway Company was held at 18 Cortlandt street on February 28. The following board of directors was elected: William H. Woolverton, Charles F. Cutter, R. M. Galloway, F. Lovejoy, Edward Lauterbach, Edward J. Hall, John Jamison, Edgar L. Ridgeway and E. E. Gedney. Inspectors of election: Messrs. John H. Catrill, Joseph Kavanagh and William B. Bouchette.

P. Claus & Co., 357 West 40th street, are about to increase their manufacturing facilities, and will require about $50,000 worth of machine tools, lathes, planes, etc.

It is reported that the John Stephenson Co., New York, has decided not to make an exhibit at the World's Fair on account of not being able to secure sufficient space for the purpose.

The General Electric Company denies the report that it had decided to abandon the idea of making an exhibit at the World's Fair on account of not being able to secure sufficient space.

The Crocker-Wheeler Electric Co. has purchased the plant of the defunct Spiral Weld Tube Company in Newark, N. J., and is now making preparations to take possession. The new electrical works it is said will give employment to over 1,000 hands. The plant is an extensive one and extends alongside the track of the Delaware, Lackawanna and Western Railroad. A feature of the new factory will be the conspicuous absence of belting and shafting throughout the entire works. The plan to be adopted is to transmit the power to each machine by wires which will connect to a motor on the machine and drive it direct. This method will be followed in the case of every machine where it is found possible, and will result in a considerable saving of power which would be otherwise required to constantly run lines of shafting and counter-shafts to each machine, as well as a large saving in the cost and maintenance of belts, counter-shafts, pulleys, oiling, etc. W. T. H.

TRADE NOTES.

The new Frank Jones Building, at Cincinnati, Ohio, will be furnished with power for electric lighting by an engine supplied by the Ball Engine Co., Erie, Pa.

The Berlin Iron Bridge Co., of East Berlin, Conn., is putting up the roof trusses on the new light and power station for the Electric Light and Power Co., Syracuse, N. Y.

J. W. Parker & Co., Philadelphia representatives of the Ball Engine Co., Erie, Pa., have lately installed a 100 H. P. Ball engine at the Bloomsburg Electric Light Co., Bloomsburg, Pa.

The Hammond Electric Street Railway, Hammond, Ind., is approaching completion. The steam plant was furnished by the Chicago office of the Ball Engine Co., of Erie, Pa., 506 The Rookery.

The F. E. Belden Mica Mining Co., Boston, Mass., has leased the store No. 12 Broad street, near State, in order to acquire more room and better facilities for the proper handling of its increasing business.

The power station being built by the Calumet Electric Street Railway Co , Chicago, Ill., is approaching completion. The engines to be used are four 300 H. P. Cross-Compound Ball engines, manufactured by the Ball Engine Co., Erie, Pa.

The Cutter Electrical and Mfg. Co., 27 South Eleventh street, Philadelphia, has just issued its circular price-list "C." The front cover is of attractive and unique design, and the various specialties of the company are illustrated and described within.

THE CHICAGO & ALTON.

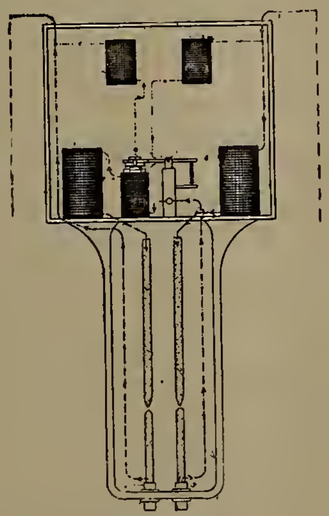
Of all the lines of railroad between Chicago, St. Louis and Kansas City the Chicago & Alton seems to be the most popular. Its passenger service is nigh perfection, and the road traverses the most prosperous portions of Illinois and Missouri. Fast time is made by the through trains, and altogether it is one of the pleasantest roads in the west to travel over.

The Electrical Age's Illustrated Record of Patents.

Issued February 21, 1893.

491,982. Electric Motor and Controlling Apparatus for Cars. John V. Capek, New York, N. Y., assignor of one-half to Edward H. Johnson, same place. Filed Nov. 14, 1891.

491,988. Electric-Railway Trolley. Alfred Dickinson, Darlaston, England. Filed Feb. 9, 1892. Patented in England March 28, 1891.



492,124.—DUPLEX ELECTRIC-ARC LAMP.

491,990. Multipolar-Dynamo-Electric-Machine Armature. George E. Dorman, Chicago, Ill. Filed Jan. 4, 1892.

491,992. Cut-Out for Incandescent Electric Lamps. Thomas A. Edison, Llewellyn Park, N. J. Filed Nov. 12, 1891.

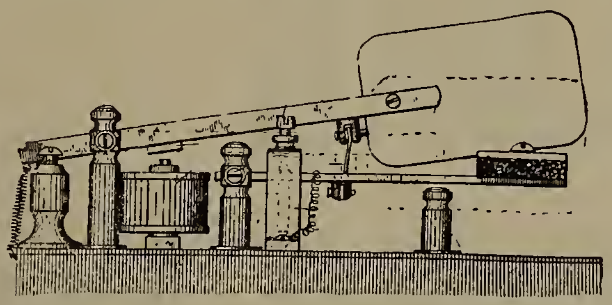
491,993. Stop Device. Thomas A. Edison, Llewellyn Park, N. J. Original application filed Aug. 24, 1891. Divided and this application filed April 11, 1892.

492,011. Electrical Indicator. Henry J. Haight, New York, N. Y. Filed June 1, 1892.

492,019. Magneto-Telephone Switch. William Humans. Cambridge, Mass., assignor to the American Magnetic-Electric Company, Jersey City, N. J. Filed July 23, 1885.

492,036. Automatic Circuit Breaker for Motors. Robert T. Lozier, New York, N. Y., assignor to the Edison General Electric Company, same place. Filed April 4, 1892.

492,106. Conduit Railway. Frank B. Rae, Detroit, Mich., assignor to the Detroit Electrical Works, same place. Filed April 11, 1891.



492,219.—LIGHTNING CONDUCTOR AND ARRESTER.

492,110. Automatic Individual Telephone-Call Apparatus. Joseph Sack, Berlin, Germany. Filed Sept. 18, 1891.

492,124. Duplex Electric-Arc Lamp. Barton B. Ward, New York, N. Y. Filed May 17, 1892.

492,150. Process of Coating Conductors for Incandescent Lamps. Thomas A. Edison, Menlo Park, N. J., assignor to the Edison Electric Light Company, New York, N. Y. Filed Oct. 26, 1882.

492,151. Dynamo-Electric Machine. Wallace E. Freeman, Long Island City, assignor to Lawrence M. Closs, New York, N. Y. Filed July 8, 1892.

492,160. Electric Elevator. Frank E. Herdman, Indianapolis, Ind. Filed March 8, 1892.

492,176. Commutator for Dynamos or Motors. Joseph A. Williams, Cleveland, Ohio. Filed May 2, 1892.

PATENTS—Continued.

492,200. Electric Arc-Lamp. Henry Harper, London, England, assignor to himself, John Tryon, and Thomas George Poole, same place. Filed July 10, 1891. Patented in England Aug. 24, 1889.

492,201 Electric-Arc Lamp. Henry Harper, London, England, assignor to himself, John Tryon, and Thomas George Poole, same place. Filed July 10, 1891. Patented in England Nov. 2, 1889.

492,215. Hanger for Electric Incandescent Lamps. Samuel O. Larkins, Blair, Neb. Filed Feb. 17, 1892. Renewed Dec. 17, 1892.

492,219. Lightning Conductor and Arrester. Adelvin B. Lyman, Cleveland, Ohio. Filed Oct. 28, 1892.

492,244. Method of Constructing Armature-Cores for Electrical Motors or Dynamos. Albert W. Smith, San Francisco, Cal. Filed Feb. 20, 1892.

492,245. Magnetic Tool. Jacob F. Standiford, Muscogee, Ind. Ter. Filed July 14, 1892.

492,247. Electrical Foot-Warmer. William E. Ulmer, Hoquiam, Wash. Filed April 27, 1892.

492,265. Conduit Electric Railway. Fred W. Brann, Oakland, Cal. Filed May 16, 1892.

492,291. Commutating Apparatus for Dynamo-Electric Machines. Edward J. Houghton and William White, London, Eng. Filed March 26, 1892.

492,295. Incandescent Gas-Lamp. Joel G. Jackson, Minneapolis, Minn., and Addison L. Daniels, Marion, Iowa. Filed Feb. 24, 1892.

492,301. Coupling for Trolley-Wires. William H. Keckeley, Covington, Ky. Filed Dec. 10, 1892.

492,309. Electric-Bell Alarm. Gustaf L. Reenstierna, Boston, Mass. Filed Oct. 12, 1892.

492,312. Electric Arc-Lamp. John Thompson, New York, N. Y. Filed May 17, 1892.

492,330. Electric Burglar-Alarm. Julius Kamsler, New York, N. Y. Filed Dec. 15, 1892.

492,355. Magnetic Core for Armatures. Thomas H. Hicks, Detroit, Mich. Filed Oct. 6, 1892.

492,377. Electric Reduction of Refractory Metallic Compounds. Thomas L. Willson, Leaksville, N. C. Filed Aug. 9, 1892.

VULCANIZED FIBRE COMPANY,
Established 1873.
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ELECTRICAL AGE

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THE CONVENTION PAPERS.

The various papers read at the St. Louis convention of the National Electric Light Association were of real practical value and of great interest, and no doubt those who heard them read or carefully read them themselves derived considerable benefit.

At the present time the insurance question is the uppermost in the minds of insurance and electric light and power managers, and the tendency in some quarters among the underwriters is to increase the rates. The paper of Captain Wm. Brophy on this general subject was a most timely one, and in it that gentleman gives some common-sense suggestions as to the manner in which the fear of the insurance men may be allayed. The secret of it is to use proper, not necessarily extraordinary, precautions in installation work and the location and equipment of generating plants. "Proceed as though you proposed to do a legitimate business, and for all time," he says. This means that everything pertaining to the business should be done in the best possible manner, on the principle that the best is the cheapest in the long run. Electric lighting has passed far beyond the stage of experiment, and the question of permanence and solidity as regards the plant should now receive the attention which is due it. When insurance underwriters see that this is being done they will not look upon electrical risks as something to be shunned. As Captain Brophy himself states, it would be unfair to say that the fire underwriters are wholly to blame for the existing state of affairs. The electrical people made mistakes in the past which the insurance companies paid dearly for, but with the experience since obtained it is possible to avoid all this. Harmony should unquestionably be preserved between the two interests.

In this line Judge Armstrong's paper on the "Morals of Corporations" has some bearing. These two papers, while on different lines, emphasize the importance of doing things right. "It doesn't pay to make too much money," Judge Armstrong says, and where is the upright business man who can doubt the truth of this assertion?

WHEN A LAMP IS NOT ECONOMICAL.

All central-station men and other purchasers of incandescent lamps should read the portion of Mr. Carl Hering's paper on the most economical age of incandescent lamps, which appears in another part of this paper.

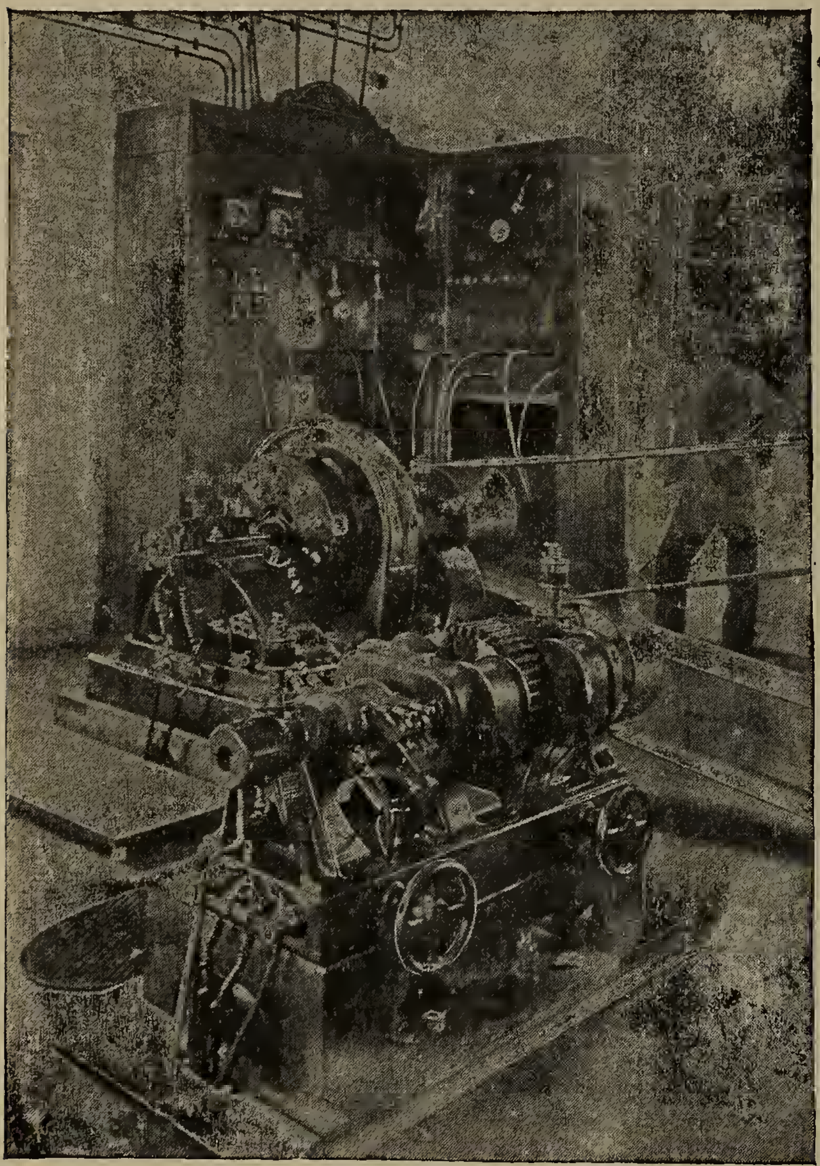
A NEW ALTERNATING-CURRENT MOTOR.

In one respect the alternating system of current distribution has a disadvantage as compared with the direct-current system. It is not capable, in the present state of knowledge, of so wide an application as is the direct current, and this, resolved into dollars and cents, means that a station operating on the alternating system has not the same earning capacity as one operated on the direct-current method, all things being equal. The weak point of the alternating system is the fact that no motor can be operated on such circuits, and this means a practical loss to the central station. It is a loss because electric power is required, for the most part, during the day time, when no light is required. To supply such power, therefore, means additional income; but where the system is not flexible enough to engage in this branch of work it means stagnant machinery during the day and reduced income. In order to increase the earning capacity of alternating-current stations it has been the object of inventors to produce a commercially successful alternating-current motor of large powers, but the problem has been a difficult one of solution. Mr. Dahl, of this city, however, claims to have solved it, and in this issue his alternating-current motor is described by Mr. F. H. Leonard, Jr. If this machine is all that is claimed for it, it will find a large field ready for its application.

A COUPLE OF COMPACT PLANTS.

Of the many electrical houses carrying on a general electrical contracting and installing trade probably none is better known in this section than that of Zimdars & Hunt, 127 Fifth avenue, New York city. They started in business eleven years ago, and were at first engaged in the work of installing pneumatic annunciators in all places where annunciators are used, particularly on elevators. In late years, however, they have included electrical work in their business, and through the first-class manner in which they fulfil their contracts they have secured the good-will of many of the principal architects and private individuals hereabouts who stand ready to speak favorably of the work of this firm.

Zimdars & Hunt have wired and fitted out electrically many private residences in this city and vicinity, and they do quite a large trade in fitting out steamers with electrical plants, also central electric-light stations and other establishments. Among the marine plants installed by this firm particular mention may be made of that on the elegant steam yacht "Corsair," owned by Pierpont Morgan, an illustration of which plant accompanies this article. The combined engine and dynamo of this plant is of Crompton's make, slow speed, double cylinder, connected direct to the dynamo, the speed being 175 rev. a minute. The dynamo has a capacity of 200 16 C. P. lamps. The wiring is all done in the tubing of the Interior Conduit and Insulation Company, and notwithstanding the necessarily limited room the tubes and wires are very accessible. The switchboard is of marbleized slate, very compact and neat in appearance, and is furnished with all the necessary appliances, including voltmeters, ammeters, switches, etc. In addition to this plant there is one of storage batteries as an auxiliary to the dynamo plant. The batteries are intended for use at any time when it is not desired to run the engine, or in case of derangement of the machinery, or any other emergency. The lights can be changed from dynamo to storage batteries by turning a specially constructed switch.



CENTRAL STATION, CORNWALL-ON-HUDSON, N. Y.

Our other illustration shows an interior view of the central station at Cornwall-on-the-Hudson, which was installed by Zimdars & Hunt. The plant consists of a Brush alternator of 1,000 lamps capacity with an exciter (shown in the foreground). All the wires running to and from the switchboard under the floor are laid in interior conduits, and the switchboard, which is of slate, is 10 x 6 feet in size. It is mounted on a finished hard-wood frame and is fitted with all the necessary appliances—voltmeters, ammeters, lightning-arresters, switches, etc. No naked wires are visible in this installation. The wires emerge from the building at the side on the second floor.

The engine is a Payne Automatic of 90 H. P.

The series system of street lighting is operated by this plant, the length of the various street circuits being about four miles. The street lamps are of 50 C. P. each, and besides the street lights there are many used in residences, mills, hotels, etc., in Cornwall and Canterbury, both of which places are supplied with light from the one station.

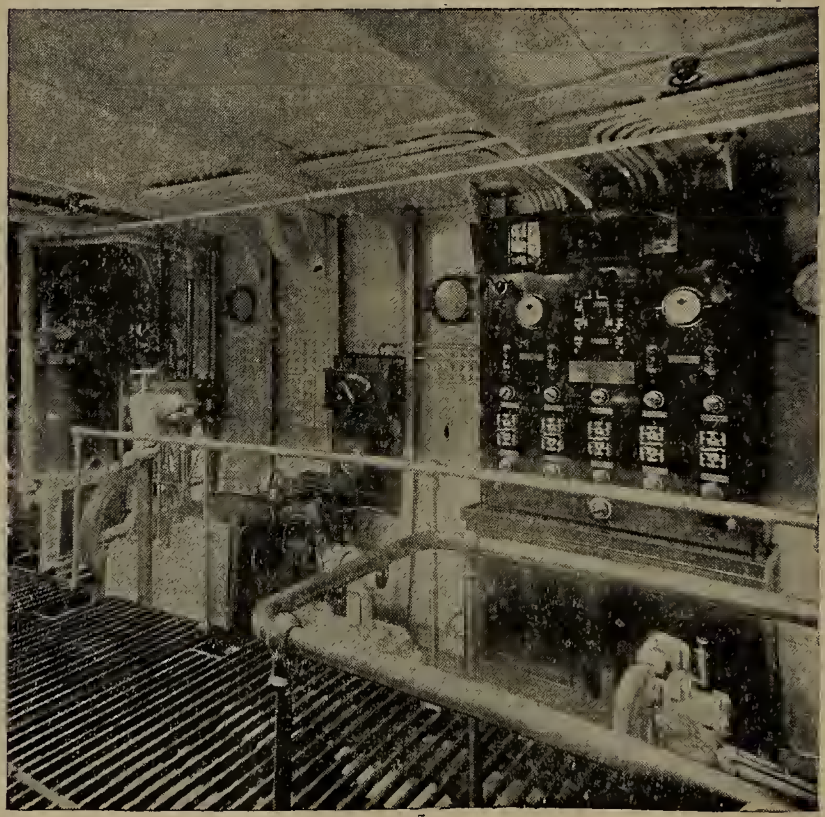
Among the many residences in this city wired by this firm is that of President Cleveland on 34th street and George J. Gould; and besides the yacht "Corsair" they have installed many others with electrical plants, including the "Utowana," "Intrepid," and the regular transatlantic line steamships "Fulda" "Werra," "Alena" and "Alvo."

Having their own factory and every facility for so doing this firm can turn out work at the shortest possible notice.

OBITUARY.

J. B. Abernethy, superintendent of telegraph, Cleveland, Ohio, is dead. Mr. Abernethy was well known as an electrical writer.

Mr. J. E. H. Gordon, the well-known English scientist and author of several papers and works on electrical subjects, died at Croydon Hospital, London, on February 3 last. His death was caused by a fall from a horse. At the time of his death he was engaged in erecting complete central stations and distributing systems at Carlow, Larne, Sydenham and Windsor. He was called away at a time when his services were most needed in these enterprises.



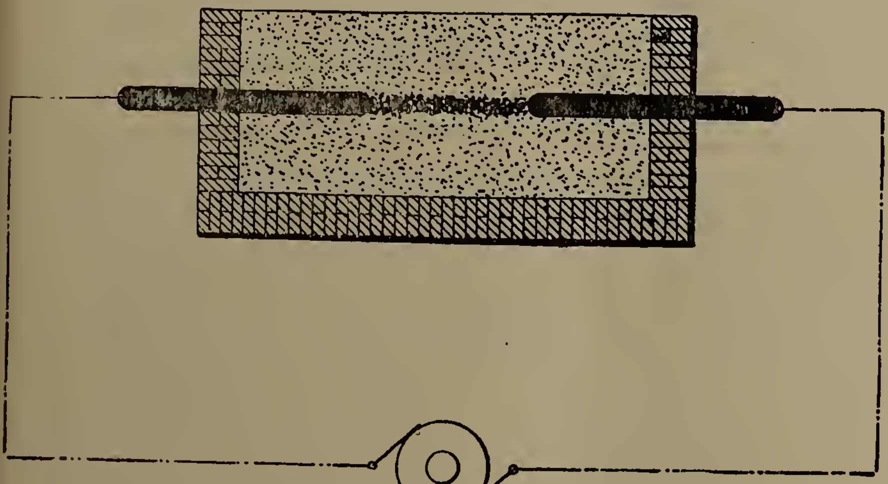
ELECTRIC-LIGHT PLANT ON STEAM YACHT "CORSAIR."

The city of South Norwalk, Conn., is defendant in a suit for damages of $12,000 brought against it by the Norwalk and South Norwalk Electric Lighting Company. The suit is brought because of alleged violation of contract.

CARBORUNDUM.

Mr. Edward G. Acheson, of Monongahela City, Pa., has just been granted a patent on a method of producing artificial crystalline carbonaceous materials by aid of the electric current. The products of the process Mr. Acheson has called "Carborundum," and the material so produced is characterized by great hardness, and is intended as a practical substitute for diamonds in their mechanical application as well as for corundum in its various forms and other crystalline materials.

Mr. Acheson's discovery in practical effect is that carbonaceous material, such as coke or gas-coke carbon, in connection with silica or equivalent as silicate of alumina or of lime, and mixed in proper proportions, then subjected to the proper degree of heat for a proper length of time, produces the hard substance which he has named "carborundum." This, he claims, is practically a new compound hitherto unknown in chemistry, and in its purity is represented by the formula SiC, and owing to its peculiar hardness it can be used for various purposes. It has been found to be a practical substitute for diamond powder and bort in cutting diamonds and other gems, and it can be used as an abrasive material for optical purposes, dental work, grinding valves, etc., by being prepared in the form of wheels, discs, cloth, etc. It is also claimed to be especially valuable as a material for the carbons for electric lights.



ELECTRICAL FURNACE.

In the production of carborundum the ingredients are finely subdivided, then placed, with common salt as a flux (the whole being thoroughly mixed) in an electrical furnace. The accompanying illustration gives a general idea of the principle of construction of such a furnace. The walls are made of fire-brick with the electrodes passing through the walls, the electrodes being connected with the two poles of a dynamo. A current of proper strength is then caused to pass through the mass in the furnace. After the process is completed the carborundum is found to surround the electrodes from which it is removed and prepared for the market. The crystals vary in color, depending upon the materials used. Some of them are colorless, while many of them are opaque, and others are of various colors. Their general form is octahedral. They are extremely hard and highly refractive, and withstand a very high degree of heat.

LEGAL.

An important suit has recently been brought by the Middlesex Assurance Company against the Middletown Electric Light Company, of Middletown, Conn. The suit is to recover $40,000 damages caused by the partial burning of the Middlesex Theatre in Middletown. It is claimed that the fire originated through imperfect insulation of the electric lighting wires put in by the defendant company.

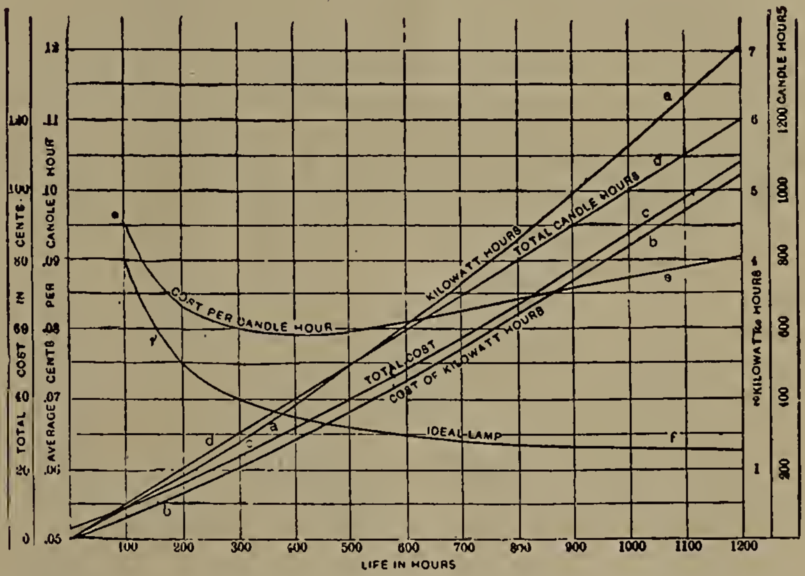
THE MOST ECONOMICAL AGE OF INCANDESCENT LAMPS.*

BY CARL HERING.

It is generally supposed that it is an advantage for incandescent lamps to have a long life. The object of this paper is to show that this is a delusion, and that it is not substantiated by facts, but that on the contrary under normal conditions a very much shorter life represents an actual gain in dollars and cents; or in more homely language, if the lamps do not die a natural death it is more economical to break them at a comparatively early date than it is too keep them in use. The results obtained in the present deductions are so different from what is generally believed that they will doubtless be discredited by many.

At the June meeting of this institute last year a very able and valuable paper[1] was presented by Prof. Thomas and Messrs. Martin and Hassler on "The Life and Efficiency Test of Incandescent Lamps." This paper gives a very complete life-history in the form of data and curves of representatives of almost all the incandescent lamps made in this country. With these very complete and reliable data as a basis I have endeavored in the present paper to deduce some figures to show what the best life of a lamp is, everything considered. It is well known that lamps deteriorate and blacken with age, becoming less efficient, and it is therefore an important question to know at what age they should be replaced by new ones; it is this point which the present paper is intended to answer.

	Watts per mean horizontal candle power.							
	A	B.	F.	C.	K.	L.	M.	Av.
Hours.								
0	3.9	4.4	4.1	4.2	3.9	3.8	4.8	4.2
100	4.3	4.8	4.3	4.6	4.3	4.2	4.7	4.5
200	4.6	5.1	4.6	4.9	4.6	4.6	4.7	4.8
300	4.9	5.4	4.9	5.0	4.8	4.9	4.8	5.0
400	5.2	5.6	5.1	5.3	5.0	5.2	4.9	5.3
500	5.5	6.1	5.5	5.5	5.2	5.5	5.1	5.6
600	5.8	6.4	5.8	5.7	5.4	5.8	5.5	5.9
700	6.1	6.7	6.1	6.0	5.6	6.1	5.8	6.3
800	6.4	6.9	6.4	6.3	5.9	6.3	5.9	6.6
900	6.7	7.1	6.6	6.6	6.2	6.4	6.1	6.8
1,000	6.8	7.1	6.8	6.7	6.4	6.2	6.1	6.8
1,100	7.0	7.2	6.7	6.8	6.5	.....	...	7.0
1,200	7.1	7.2	6.7	6.7	6.5		..	7.0



The method by which the best age is to be deduced is the new and very rational one suggested by Mr. O'Keenan and described in *L'Industrie Electrique*, Nov. 25, 1892, page 510, also in *The Electrical World*, Dec. 24, page 404. As it is fully described in these articles I will

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[*] Read at the seventy-fourth meeting of the American Institute of Electrical Engineers, New York, February 21, 1893.

[1] Transactions, vol. ix., 1892, p. 271.

merely state it briefly here. Calculate *for each hour* in the life of a lamp the *total quantity of light* given off by it in candle-power hours *from the time the new lamp was first started;* similarly, calculating *for each hour* in the life of a lamp the *total cost* of this light, that is, the original cost of the lamp added to the cost of all the energy consumed by it *from the time the new lamp was first started* up to that particular hour. Now, it is evident that if for each hour in the life of a lamp we divide this total cost up to that hour by the total quantity of light up to that hour, we will obtain the *average* cost of a candle-power hour of light from the beginning up to this hour. From these final data it can readily be shown at what age this total average cost is the least. If based on actual measurements of the lamp made throughout its life it is evident that this method will give the most rational and only strictly correct way of determining the real cost of the light actually produced; the only factor which it does not include is the interest on the cost of the lamp and power which evidently are negligibly small. It includes the effect of the blackening of the bulb and of the lowering of the efficiency. It should be distinctly understood, however, that this method is based on the actual amount of light produced, and on the actual cost of the power; whenever, therefore, either or both of these factors are not of importance the results deduced here are also of less importance. I desire to emphasize this as it will doubtless be claimed by many, and with right, that the diminution of the light is of less importance to some consumers than the cost of a new lamp would be.

Having given the candle-power and the power consumption of a lamp throughout its life, any one can by this method deduce the final results as described. In the present case, however, the work, which is somewhat tedious, is greatly simplified by taking the data from Table V. in Prof. Thomas' paper, giving the watts per mean candle-power. These data are given here in Table I. for the seven most important of the thirteen makes of lamps; the last column giving the average is the average of all of the thirteen lamps of that paper and not of the seven which we have here taken as the most important. By using the watts per *one* candle-power it is evident that the candle-power curve in the present calculations becomes a straight line, thus reducing the work by more than one-half.

To illustrate the method let us deduce the results given for the average lamp in the last column. Instead of calculating the results for every hour, which is a very tedious process, it is sufficiently accurate to do so for every hundred hours. From the last column of Table I. calculate for each hundred hours the total kilowatt hours consumed per candle up to that age; the result gives the curve *a*, Fig. 1. Multiply these values by the cost of a kilowatt-hour of energy—fifteen cents is the price assumed here—this gives curve *b*. Add to these values the original cost of the lamp *per candle*, that is, the total cost of the lamp divided by the candle-power at the start; this gives curve *c*, which is evidently parallel to curve *b*. Draw curve *d*, representing the total candle-power hours from the start; in this case this line will evidently be straight; it would be curved if the watts consumed by the whole lamp and if the whole candle-power had been used instead of the watts per one candle. Curves *c* and *d* are those sought for. These curves are evidently the integrals of those represented by the numbers in the table. The process of integrating is effected most readily by purely arithmetical means as described above, that is, by simply calculating the totals for each hundred hours, and it can, therefore, be performed by any one without a knowledge of algebraic integration. These curves, however, need not be plotted, they are given here only to illustrate the method. Now divide each ordinate of the cost curve *c* by the corresponding ordinate of the light curve *d*, and the result is the curve *e*, which is the final curve sought for.

This curve *e* gives for each age the cost of a candle-power hour of light, that is, *the average cost for the whole time from the time the lamp was first started up to that particular hour.* This is the curve which gives us the final results. The interesting feature about it is that it has a minimum point at about 400 hours, which means that at the end of 400 hours you are paying the least for a candle-power hour of light, that is to say, your light is then the cheapest during the whole life of the lamp, all things considered. If you continue to use those lamps longer than 400 hours the *average* price for the light will again increase and will continue to do so. Strange as it may seem, therefore, it is more economical to break the lamp at that age rather than to continue running it, even though this means buying a new lamp. This result will naturally be discredited by many, but it is nevertheless true, always remembering that we are concerned with the cost of a candle-power hour of light under normal conditions and over an indefinite period. If the amount of light is of no great importance but the price of the lamp is then run them till they die a natural death; the same if the power cost nothing. If your lamp costs nothing but your power does then replace them as often as possible. The effect of different relative costs of lamps and power will be discussed later. The data assumed in this curve are that the average lamp costs 45 c. and the power costs 15 c. per kilowatt hour; the latter figure was obtained from a well-known central-station manager as a fair average for 110-volt continuous-current circuits from central stations or for private installations of about 500 lamps; for installations of less than 500 lamps the cost will be greater, and for more it will be less.

As this curve must always have a minimum point for lamps which deteriorate, there is no question that there is such a minimum value in the cost of the light. Mr. O'Keenan calls this point by the appropriate name "smashing point." To show the results of an ideal lamp curve *f* has been drawn. This ideal 16 C. P. lamp costing 48 cents and consuming 4 watts per candle is supposed not to blacken or to change in any way. It is evident that in this case there will be no minimum point and the longer such a lamp is run the cheaper the light is, although after a few hundred hours the cost diminishes very slowly, being practically the cost of the power only.

To show what the curve *e* really means in dollars and cents let us calculate an actual case. If run 1,200 hours the average cost per candle-power hour is .0903 cents or a total of 108.4 cents per candle for 1,200 hours. A 16 C. P. lamp therefore represents a total cost of $17.344 for power and lamp, assuming for the sake of simplicity that it continues to give 16 candle-power. If stopped at 400 hours the cost of the light is only .0792 cents per candle hour or a total of 31.7 cents per candle for 400 hours; if renewed three times in the 1,200 hours the cost will be 95.1 cents or $15.22 for 16 C. P. This shows that replacing the lamp after every 400 hours represents an actual saving of 13.3 cents per candle during a period of 1,200 hours or a total of $2.12 saved per 16 C. P. lamp every 1,200 hours. This amount of money represents the cost of almost five lamps at 45 c. which might be interpreted so as to show some very curious results, namely, if you bought eight lamps originally, used only three of them for 400 hours each and threw the other five away, it will in the long run cost you the same as to buy one lamp and run it for 1,200 hours, assuming that you are paying for light actually received. As the cost of the light at 400 hours is over 12 per cent. less than that at 1,200 hours, it is an actual saving of 12 per cent. in dollars and cents if the lamps are replaced every 400 hours.

Another curious result which it will be hard for many to believe is shown by the fact that the curve *e* cuts the .09 line at 1,200 hours and also at about 130 hours, which shows that the light costs just as much whether the lamp is broken at 130 hours or run for 1,200 hours. The curves being flat near their minimum points shows that it makes practically no difference (always remembering that we are considering the cost of a candle-power hour of light) whether the lamps are replaced every 300, 400 or 500 hours. It might at first be thought that at 300-hour renewals the lamps will make the cost greater than at 500 ; but this is not the case as the curve includes the cost of these new lamps. The explanation of this is that we are considering a constant amount of light and if run to 500 hours more lamps must be used to give the same amount of light owing to their reduced candle-power. Of course in practice they will be renewed at 500 instead of 300 hours, because the difference in the light would be noticed less than the price paid for the more frequent renewals.

Another interesting and somewhat surprising result which may be deduced from the curves is that an ideal lamp of 16 C. P. which remains constant may cost originally as much as $5.75 and will then give precisely as cheap light during 1,200 hours as the existing lamps, and even then it will be cheaper during the next 1,200 hours than the others. An ideal lamp equal to the others at 400 hours instead of 1,200 can cost as much as 75 cents and will even then be considerably more economical after those 400 hours. This theoretical deduction only goes to show how very great the value in dollars and cents is of a lamp which remains constant.

MOTORS FOR ALTERNATING CURRENTS.

BY F. H. LEONARD, JR.

The alternating system has heretofore been lacking in a very essential feature detracting from the earning capacity of a central station, from which it is operated. We have until now seen in practical operation no motor operated from simple two-phase alternating current which could be termed a commercial success. Many futile attempts have been made to produce such a motor, and the minds of the greatest inventors of this and other countries in the civilized world have been struggling with this knotty problem. Expensive experiments have been made in this country and in Europe on what is now known as the multiphase system, and where cheap power is obtainable motors operated from such a system will no doubt meet with a limited success; but the low commercial efficiency of this system of power distribution, together with the other objections associated with it, prohibit its use where the cost of fuel or power is a matter of any importance.

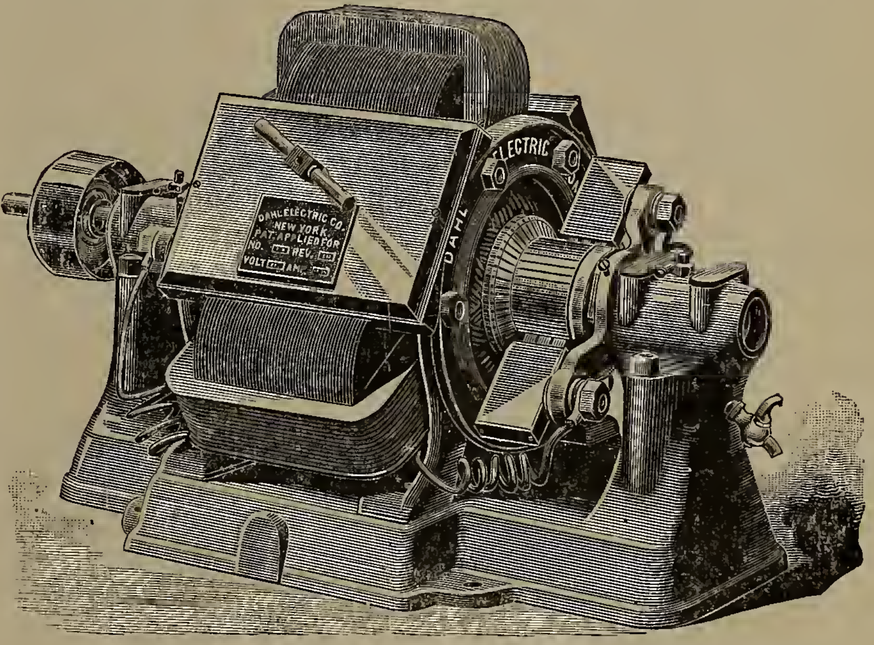
The use of three wires, which is necessary with the multiphase system, not to mention the added parts of the generator, complicates the system, which must be balanced up in much the same manner as the Edison or Hopkinson three-wire system, without gaining the advantage in the reduction of copper, but on the contrary adds one third to the cost of conductors, provided the same pressure is maintained.

The converters required to operate motors from a multiphase system must have a capacity enormously in excess of what is actually required in watts to perform the work the motor is calculated for, and when it is desired to operate incandescent lights from the same circuit a special transformer of complicated form is required, and to operate to best advantage this transformer must have both branches equally loaded.

We doubt if such a system can ever be successfully and extensively introduced into this country, where the simple two-phase alternating system has taken such powerful root and branched so rapidly and extensively. Consider what such a change would involve. The present generators must be abandoned, the present system of wiring must be entirely remodelled, and a third wire added. The present converter must also follow the generator to the scrap-heap, and the system of inside wiring must be remodelled to suit the changed conditions.

We might put up with the change in generators alone, for the sake of adding to our income the revenue to be derived from motors, and complaisantly consider the much evener curve in the ampère output of our central-station plant, which would then be earning almost as much during the hours of daylight as during the hours of darkness; but shall we do the rest—shall we abandon our present system entirely, and go down into our pockets for the price of an entirely new equipment ? No! We trust we shall never be compelled to, for already in our dreams we see the ideal central station, which we have every reason to believe will be realized in the near future.

Let us briefly sketch this ideal. A central station operating night and day with practically the same output in ampère hours from 6 A.M. to 6 P.M. as from 6 P.M. to 6 A.M., equipped with high-pressure boiler, furnishing steam to triple-expansion upright engines coupled direct to alternating-current generators without collector rings, commutators, or brushes or any moving wire, which, owing to the reduction of iron losses, are more efficient than those in use to-day, furnishing a simple two-phase current at a primary pressure, perhaps not materially different from the present standards, except for special long-distance transmission, when, by changing armature connections, the same generator may produce much higher pressure, or the E. M. F. increased by step-up transformers. The current from these generators transmitted over the same system of distribution as used at present, except where conditions might warrant underground wiring, at the house transformed by a single two-phase converter, improved as to regulation and leakage loss, to a safe pressure for commercial and domestic use, furnishing arc lights, incandescent lights and power not only for stationary purposes, but for locomotive purposes in propelling street cars, suburban railways, and even by sections the trunk lines of the country ; and not to forget the electro-deposition by motor generators furnishing direct currents for plating as well as for charging storage batteries.



DAHL ALTERNATING-CURRENT MOTOR.

The key to this happy idealistic situation lies in the production of a practical simple two-phase motor, which can be connected to any of the present alternating systems, whose lines of distribution penetrate the vitals of so many of our largest cities, weaving a network through its many arteries to its outermost extremities.

Mr. Olof Dahl, of the Dahl Electric Company, has produced such a motor, and a number of them are already in daily use. These motors can be made in any size, from one horse-power upwards, are synchronous, hence *must* run at a uniform speed, provided the generator runs steadily, and are self-excited, starting themselves vigorously with a torque about equal to their normal capacity. They have a commercial efficiency equal if not superior to the best direct-current motors, the one horse-power size having an efficiency of 75 per cent., and increasing with the size of motor up to over 90 per cent. There is no undue heating in any of the parts, and neither armature nor field-coils rise in temperature more than 30 degrees above the surrounding atmosphere under normal load, and there is no heating of the field-cores. Should the armature be stalled (and this does not occur till the motor has fifty per cent. over load) it is not injured and no serious heating of the coils takes place, the current being choked back by self-induction.

This motor is designed to operate on the alternating system in use at the present time, without any reduction in the number of alternations, which is called for in the use of the multiphase, involving as it would more expensive transformers, greater in weight proportional to the reduction of alternations.

We can start at once to increase the earnings of our alternating central stations without the slightest change in our system of distribution, from the lines already erected, and from the same transformers used for lighting at night motors can be operated in the daytime, and both motors and lights at night, if the capacity of the transformer is sufficient.

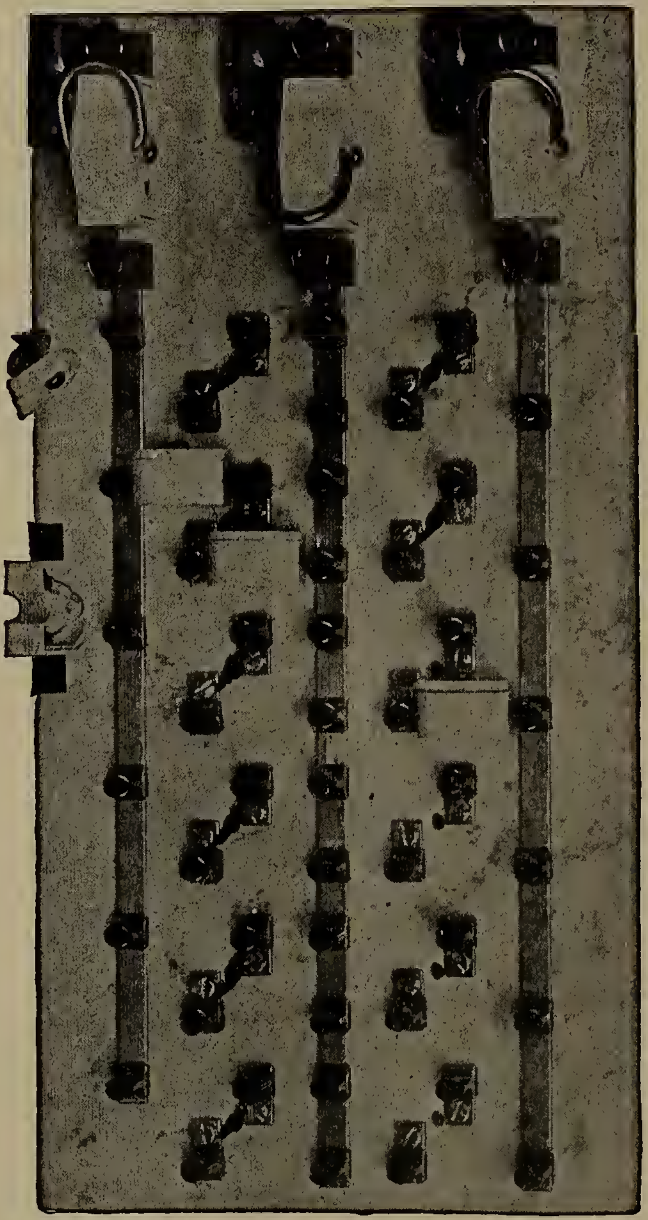
PANEL DISTRIBUTION-BOARD.

An improved method for controlling the distribution of the electrical current in buildings, which could take the place of a number of cumbersome porcelain cut-outs, has long formed the desire of construction and wiring men. For the past six years they have continued, perforce, the use of the tree system and the porcelain cut-outs; and the desired improvement seemed beyond the conception of inventive minds, or not of sufficient importance to merit deep attention. An aggregation of separate cut-outs enclosed in a cupboard, and hidden from sight in some secluded portion of the building, hard to get at, and when gotten at, difficult to manipulate, has long been considered antiquated, but the hour of its supersession has only just sounded.

It has remained for the inventive talent at the command of the General Electric Company to invent a system which not only does away with the unprepossessing, ponderous, porcelain link or plug cut-outs when used as distribution centres for a number of circuits, but substitutes what is really a handsome device fulfilling all the functions of its unwieldy congener. The simplicity of the device is such that it is a matter of surprise to us that the invention has not been made long ago.

The illustration shows one of these panel distribution-boards, arranged for the distribution of current for 120 lights from a three-wire main service over twelve circuits on a two-wire system. The panel itself is a polished white marble slab ten inches by twenty inches. The main wires are brought to the lugs, and are continued along the front of the panel in the shape of flat, hard-drawn copper rods. Upon these are mounted stiff spring copper clips. Each main wire and each side of each branch circuit is protected by a fuse enclosed in a porcelain box of novel design, from the sides of which project short flat plates of copper. By means of these blades the fuse-carrier is inserted in position, and is there securely held by the copper clips. A perfect frictional contact is thus secured.

The construction of the fuse-carrier is peculiar. It is literally a box with three sides straight and one arched having a partition in the centre between the two terminals to which the fuse is fastened, as shown in the illustration. When compared with the time-honored screw plug or ordinary fuse its advantages are so obvious that practical men cannot fail to recognize and appreciate them. No short circuit can possibly occur between the terminals; the arc cannot follow the fused metal and burn them out; the molten metal cannot be blown out, the mica-lined cover preventing this; the area of contact is considerably greater than in the case of the screw fusible plug, and in replacing a blown fuse the wireman is not exposed to any danger from a sudden blow of the new fuse. A fuse carrier can be removed and the fuse replaced on the spot, or a fresh one can be inserted, and that in which the fuse has blown can be carried away and the fuse replaced at the repair-shop or the works. The removal of a fuse-carrier, with fuse, of course, disconnects the circuits. The porcelain-carriers are practically indestructible by the current. They are made from the best white vitreous porcelain from the porcelain factory of the General Electric Company.

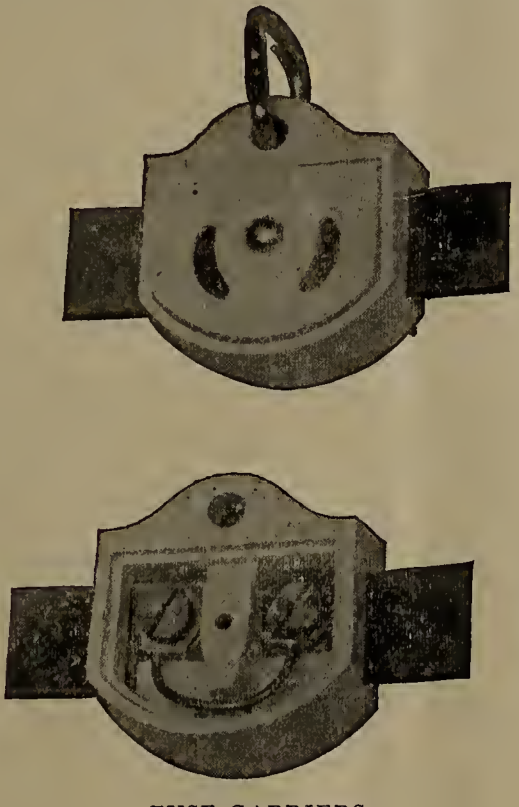


PANEL DISTRIBUTION-BOARD.

The fuse-carriers protecting the main wires are furnished with a small brass ring to facilitate their removal —the smaller carriers are more easily drawn out and the ring is unnecessary.

All connections are made upon the face of the panel. This disposition enables it to be fastened against a wall, or to be sunk in a recess, bringing its surface flush with the wall, a glass door hinged to a polished wooden frame serving to protect it from the merely inquisitive.

This style of panel distribution-board can be made up in almost any combination of circuits, and can be placed almost anywhere in any building, its handsome appearance detracting in nowise from any surrounding decoration. The new Waldorf Hotel, in New York city, is the first building to be fully equipped with these panels, no less than 3,500 lights being distributed from a number of them.



FUSE-CARRIERS.

THE "TELEPHOTOS."

On the evening of February 9 Mr. C. V. Boughton practically described his "Telephotos" system before the Buffalo Electrical Society, at his works on Seventh street, Buffalo, N. Y.

The "Telephotos" is designed for the purpose of communicating between ships at sea, armies in the field, and for other similar purposes now usually accomplished by means of rockets, flags and other visual devices. Among the advantages claimed for Mr. Boughton's invention is the facility with which such communication can be effected, the compactness of the apparatus, which permits of easy transportation, and the unlimited scope of the communications. The Morse telegraphic code of dots and dashes is employed for signals; and these are produced by means of incandescent lamps, operated by dynamo currents and controlled by a keyboard on which the characters are designated or marked by Roman letters, thus enabling any one, whether familiar with the Morse code or not, to transmit despatches, which must, of course, be received and translated by an attendant, expert in reading those characters.

The lamps employed to produce the dots and dashes are arranged in a vertical or horizontal line, and are of the ordinary 32 C. P. make. They are placed in individual sockets with suitably arranged reflectors for projecting the rays of light. There are 106 of these lamps, two of which are glowed to produce a dot, 20 to produce a dash and twenty intervening lamps left unilluminated to effect the space between the dots and dashes. Sixty lamps are glowed for a long dash representing the cipher, and two red lamps denote a period. The lamps are controlled by a keyboard not dissimilar to the keyboard of the conventional typewriting machine. It is a marvel of ingenuity. The case is made of aluminum, to secure lightness, and is contained within an area of two and one-half feet square, with a depth of six inches. The keyboard, comprising 37 letters, numerals, etc., occupies one foot and six inches; the remaining portion is taken up by the electrical connections, of which there are necessarily a great number. The manner in which the multifold connections necessary to energize the required number of lamps to produce any required letter when its key is depressed are made is best understood by imagining a flat commutator, having a segment for each lamp, against which is pressed a metallic bar covering all of the segments, on the face of which bar are gaps over the segments connected with the lamps not to be energized in producing the letter represented by the key depressed. The keys are marked by letters and figures on rollers running across the keyboard which are simultaneously revolved by a thumbscrew and ratchet at the side of the machine. As each side of the rollers have a sequence of the letters, etc., starting from a different letter of the alphabet, secret signalling is effected by a transposition of the alphabet and the code. When the rollers are in their normal position the letters correspond with the Morse characters produced, but when the rollers are turned, depressing the key designated by the letter A may cause the Morse B to be shown by the lights, or any other predetermined Morse character. Attached to the keyboard is a very ingenious and simple device, the invention of Mr. Boughton, which locks all the keys except the one depressed and prevents more than one key being depressed at a time. Mr. Boughton has also applied this device to typewriting machines, where it fills a long-felt want.

The key and the lamp boards are connected by a cable containing the requisite number of conductors, and may be of any desired length. The weight of the keyboard is about 75 pounds and that of the lamp frame 120 pounds. It is stated that the weight of a wagon containing all the apparatus necessary for field operation, including boiler, engine and generator, will not exceed 1,500 lbs.

Mr. Boughton has demonstrated that his signals can be read at a distance of three miles by daylight and ten miles at night. He feels confident that these distances can be increased. The apparatus can be worked at a speed of fifteen words per minute, and has the advantage of greater scope and precision than any other method of signalling in vogue.

Mr. Boughton has just completed a keyboard which contains an automatic device for recording the messages as they are transmitted. This is accomplished by an ingeniously arranged type-wheel mechanically controlled by the key-bars, which, when depressed, bring the corresponding letter on the type-wheel in position to be embossed on a moving paper tape, by the pressure of the armature of an electro-magnet energized when its circuit is completed by the key being fully depressed. The record produced is authentic, because it can only be made by operating the lamps.

Mr. Boughton sails in a few days to exhibit his system to the officials of the British navy, and will have it in operation in Washington during the international navy review to be held there in April.

The Missouri Water and Light Company, of Kansas City, Mo., has filed a certificate to increase its capital stock from $2,000 to $75,000.

A franchise has been granted for an electric-light plant at Wellsville, N. Y., to the Wellsville Electric Light, Heat and Power Company. The directors of the company are: J. G. Kaebler, Maurice O'Connor, Jr.; C. D. Crandall, John McPherson, and John Kaebler. Officers: President, J. G. Kaebler; secretary, Maurice O'Connor, Jr.; treasurer, C. D. Crandall.

MEASURING INSTRUMENTS OF PRECISION.

Queen & Co., incorporated, of Philadelphia, have recently put upon the market some electrical measuring instruments so original in design and efficient in use as to call for special mention. As it would be difficult at this time to mention all of this new apparatus we shall confine ourselves to a description of two pieces which we consider most important in practical engineering. Fig. 1 shows this new form of D'Arsonval galvanometer. The magnet is horizontal, circular in form, and built up of a number of discs stamped from sheet steel. The pole-faces are shaped so as to give readings on a straight scale exactly proportional to the currents measured. The coil is long, narrow and circular in cross-section, and is fastened in an aluminum tube which forms part of the movable system. No iron core is used. The suspension-tube is fitted with a movable bottom, which when raised lifts the coil so as to relieve the suspension, and clamps it tight. This prevents any injury during transportation. The whole suspension-tube can be lifted out and replaced by another, automatic sliding contacts being made as the tube is put in position. To use the instrument all that is necessary is to lower the bottom gently and relieve the oil. The mirror is so arranged that the axis of rotation lies in the centre of reflecting plane, and the window of the mirror-cage is tilted to prevent reflection from its surface. The instrument is sensitive to a high degree, and being absolutely uninfluenced by strong and varying fields or mechanical vibrations gives as accurate results when used in a dynamo-room as when used on a brick pier in a laboratory. It therefore extends the range of usefulness of a highly sensitive galvanometer far beyond anything yet reached. For general use the motion is made absolutely dead-beat so as to obviate the necessity of using "tapper keys" and to save an enormous amount of time, which is very important when rapid and exact work is demanded. This should recommend it to central-station men as well as to professors. Tubes are also made for ballistic work in which the damping effects is lessened, and in this connection a bifilar suspension has been used. With two suspensions of .0015″ phosphor bronze strip 20″ long and $\frac{3}{32}''$ apart and a coil of 703 turns of No. 40 copper wire whose resistance is 450 ohms, a throw of 25½ cms. with 1 microfarad and 1 Carhart cell and a period of 10 seconds was obtained. When used as a ballistic galvanometer the coil on being thrown to the end of the scale may in every case be brought completely to rest in from 12 to 15 seconds by merely short-circuiting. The instrument can also be used for thermal work, and with a suspension of phosphor-bronze strip rolled from .002″ round wire, spring .0025″ platinum silver, coil 275 turns of No. 32 copper wire with a resistance of 25 ohms, and junctions having a value of .00004 volts per degree C. change, a deflection of 1.9 cms. per degree change was obtained. It is certainly a very remarkable instrument, being second in sensibility only to a high-grade Thomson galvanometer, and second to none in being uninfluenced by varying external fields or mechanical vibrations.

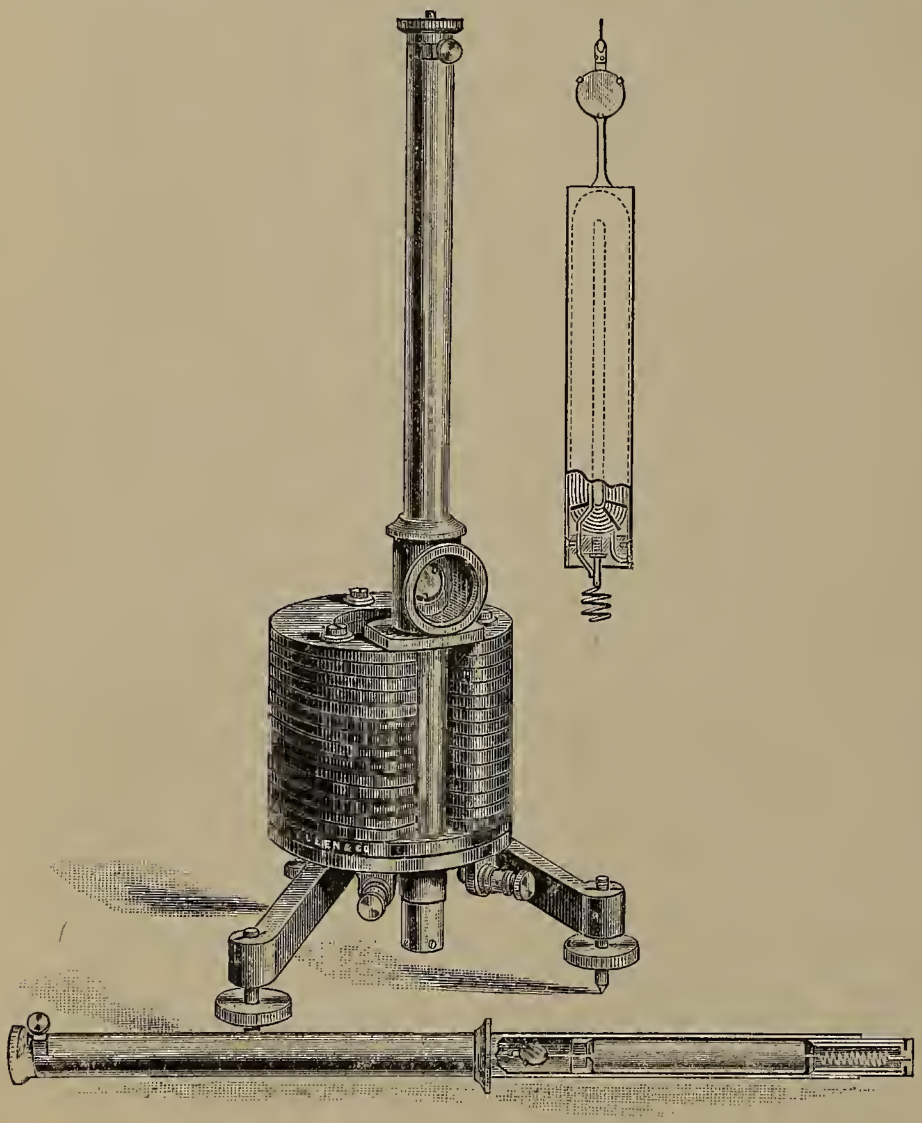


FIG. 1.—D'ARSONVAL GALVANOMETER.

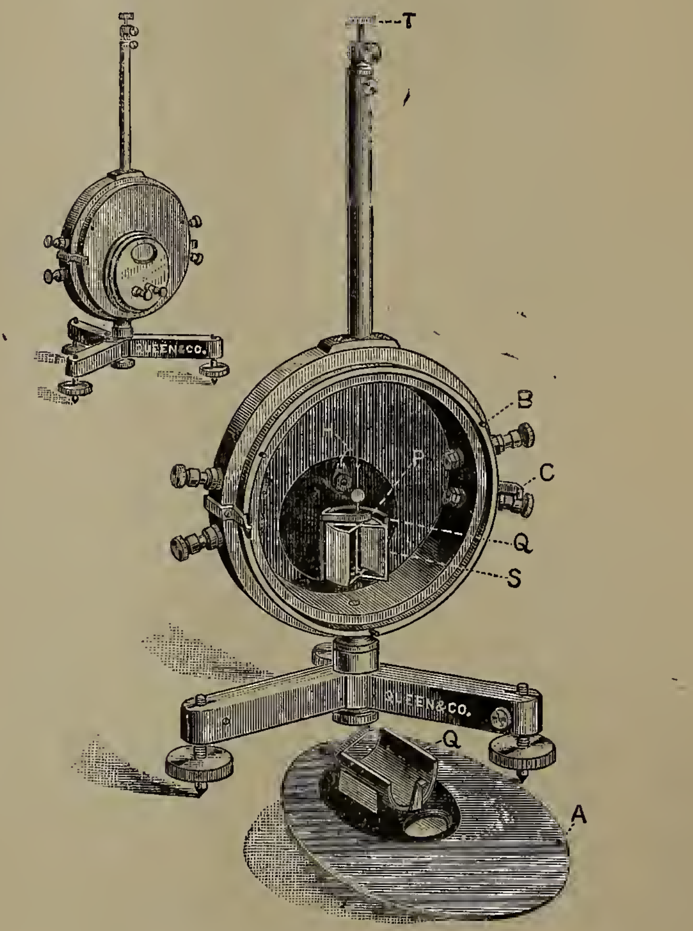


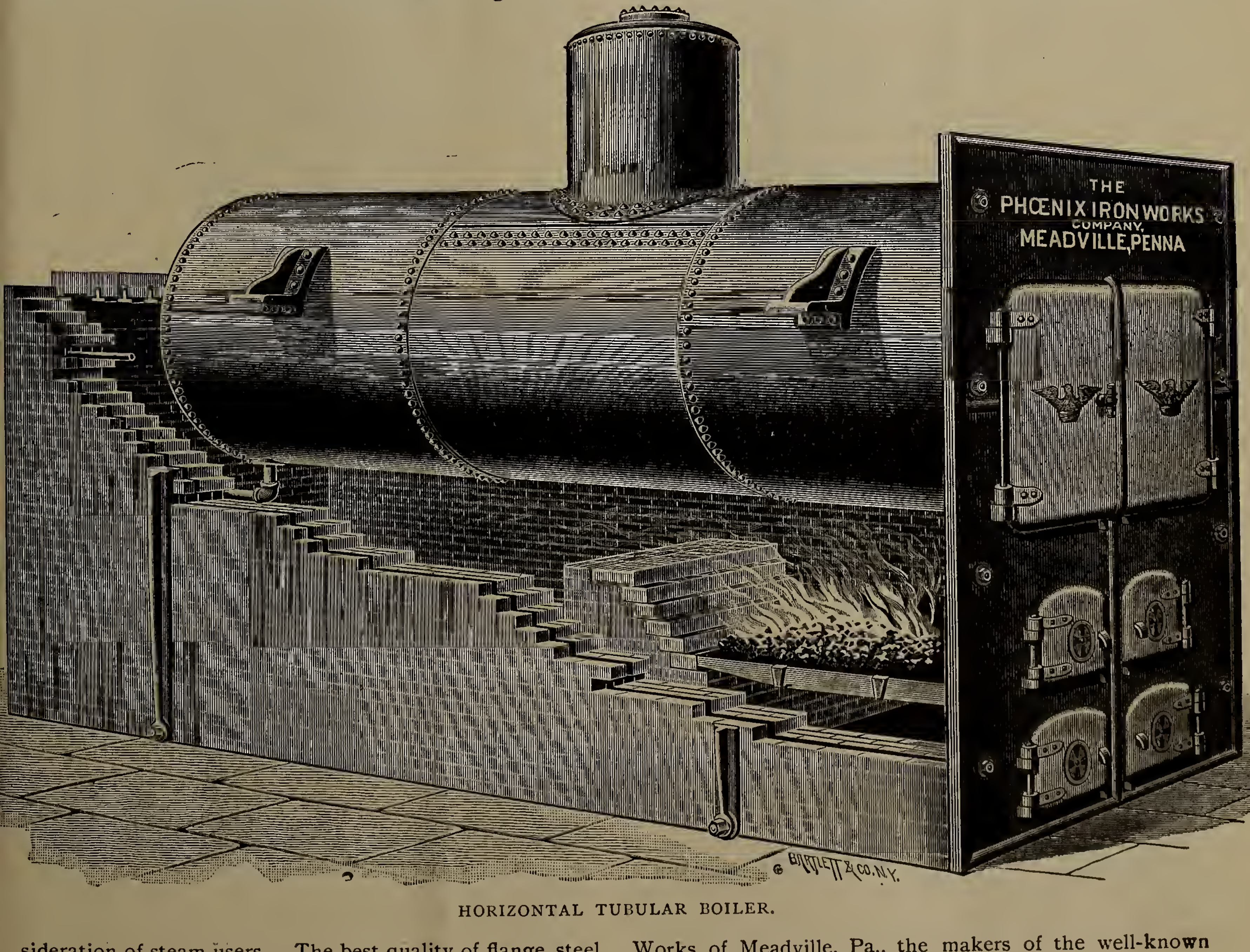
FIG. 2.—RYAN ELECTROMETER.

Figure 2 represents the Ryan electrometer. This instrument was designed by Prof. Harris J. Ryan, of Cornell University, for measuring potential difference either direct or alternating. The quadrants, four in number, are mounted on two quartz discs set on the inside of two metal cover plates that protect the system, and are faced with mica to prevent short-circuiting should the needle happen to touch them. The needle is cylindrical in shape and can be hung with either quartz or silk suspension. It is situated exactly in the centre of the cover-case, and just above it is fastened the mirror whose silvered surface contains the axis of rotation. The cover-case is made of two parts symmetrically disposed with respect to the system and held in position by a spring clip. In this way both parts, each carrying a pair of quadrants, can be lifted from the frame so that the needle may be inspected. Three little pegs over which each half of the cover plate fits insure their returning to the same relative position. Opposite quadrants are rigidly connected by metal strips, the two pairs being connected to binding-posts on the outside of the cover-case. A binding-post also on the outside of the cover-case connects with a hook on the inside, from which a connection is made with the needle by a platinum wire .0002″ in diameter.

On the circumference of the cover-case and symmetrically disposed with respect to the system are two wound coils, one of course and the other of fine wire. These enable the instrument to be used in two ways. Either the E. M. F. may be calculated from the deflection it produces, this being measured by a scale and telescope, or else a zero method may be used, in which the needle is brought back to zero after being deflected by the action of a current passed through the wound coils mentioned above and the E. M. F. calculated from the magnitude of this current. This latter has the advantage of giving results unaffected by changes in the earth's field. The instrument can be used with equal success on direct and alternating circuits, as it takes no current and has no induction to be corrected for. It takes up very little room, is strong in make, and recommends itself as much for commercial as for laboratory work. It is especially advantageous in determining the efficiency of transformers by "three electrometer reading" method.

HORIZONTAL TUBULAR BOILER.

The boiler shown in the accompanying illustration possesses some features that are well worth the thoughtful consideration of steam users. The best quality of flange steel is used in the construction of these boilers, and in order to render the joints as tight as it is possible to make them all the sheets are planed before being riveted and the joints calked. The boilers are thoroughly braced.



HORIZONTAL TUBULAR BOILER.

The tubes are annealed before they are expanded and after being set they are beaded over in a careful manner.

Manholes are provided over the tubes of all the boilers made by this company, but boilers over 42 inches in diameter are provided with an additional manhole, under the tubes, at the front end. The boilers of the small sizes have a large hand-hole.

One important advantage possessed by this make of boiler is the fact that all boilers are made of one sheet in circumference, and the longitudinal seams are turned above the fire and water line, thus greatly reducing the possibility of leakage below the water line.

The longitudinal seams and dome flanges on all sizes of standard boilers above 36 inches in diameter are double riveted, while on the special boilers, built for 120 to 150 lbs. pressure, they are made with butt and strap joints and treble riveted.

The tubes are placed at least one inch apart, while there is a space of at least three inches between the shell of the boiler and the nearest tubes, consequently there is a free circulation, and as there is a considerable body of water between the shell and the tubes there is little danger of the latter becoming burned. By this method of construction water containing lime and other sediments may be used in these boilers.

That the company has positive faith in its boilers may be inferred from the fact that each purchaser of a boiler receives a certificate of inspection and policy of insurance for one year, issued by a responsible steam-boiler inspection and insurance company which tests and inspects the boilers before shipment from the works. Each policy is made payable to the purchaser of the boiler covered by it and continues in force and is valid wherever the boiler may be located.

The company carries only the standard flange steel boilers in stock, all other grades being made to order.

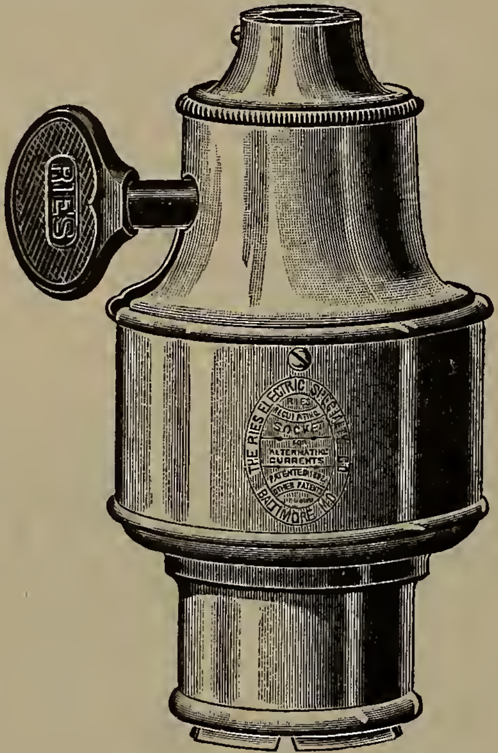
These boilers are manufactured by the Phœnix Iron Works, of Meadville, Pa., the makers of the well-known Dick Church high-speed automatic cut-off engines, which are widely used in light and power stations.

THE RIES IMPROVED UNIVERSAL BASE REGULATING SOCKET.

BY ELIAS E. RIES.

Among the many valuable devices that have been recently produced, and which have an important bearing upon the incandescent lighting industry, is the well-known Ries Regulating Socket. Since this little device made its first public appearance at the Montreal convention of the National Electric Light Association, in August, 1891, it has not only largely extended the sphere of the incandescent electric lamp, but has in reality opened up a new era in the art of electric lighting and has placed the latter far in advance of other methods of artificial lighting for general and domestic use.

The Ries Regulating Socket, as the reader is doubtless aware is so constructed as to permit the incandescent electric light to be turned up and down in brilliancy, ranging all the way from a faint glow to the full candle-power of the lamp, in the same way as has long since been common with gas and oil lamps. This important result is effected without the introduction into the lamp circuit of a "resistance" or any other current-wasting medium, and is accomplished by means of a small and peculiarly constructed "reaction coil" placed within the lamp-socket, which, when used on an alternating-current circuit, sets up a *variable counter electro-motive force* that cuts down the electro-motive force supplied to the lamp, and consequently also the current flowing through the lamp, in accordance with the degree of light desired. In addition to the regulation of the light, the Ries Regulating Socket has the important advantage that it reduces the strain on the lamp filaments not only in the act of turning on and off the light, which in this socket is performed gradually instead of suddenly, but also in the regular use of the lamps at such times when less than the full candle-power of the light is needed, thereby very materially prolonging the useful life of the lamps with which the regulating socket is used. Thus the incandescent electric lamp, which up to this time has had the serious drawback that the amount of light given by it could not be controlled by the consumer, and that the cost of lamp renewals was disproportionately large in comparison with other lamps, is at last placed upon an equality with its present rival, gas, both as to convenience and economy in use, and is enabled to bring within the control of the central-station manager a vast amount of business that has heretofore been entirely beyond his reach.

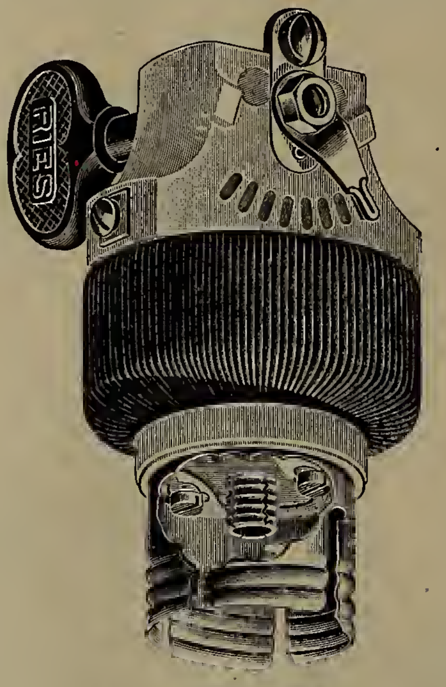


UNIVERSAL RIES SOCKET.

The regulating socket as it is now being manufactured by the Ries Electric Specialty Company, of Baltimore, Md., embraces a number of important improvements that render it far superior in every way to those first placed upon the market.

By referring to Figs. 1 and 2, which illustrate an outside and inside view of the improved socket, respectively, it will be seen that the socket comprises among other things the base or lamp-holding portion proper, the reaction coil by means of which the opposing or regulating counter electro-motive force is generated, the insulating block or support containing the contacts representing the coil terminals, the operating key, switch-arm and binding-screw connections for the leading-in wires, and the enclosing shell, the latter made in two separable parts.

The reaction coil used in this socket consists of a small finely laminated annular iron core 1¼ inch wide and ¾ inch high, built up of very thin specially treated iron rings, carefully assembled and taped. This core is evenly and skilfully wound by hand with a silk insulated cable composed of seven separately insulated copper wires varying from each other in size according to the maximum current that each is required to carry, the wires being of different colors to facilitate their proper connection. The ends of this cable, after it is wound upon the core, are then bared and the extremities of the individual wires, each with part of its insulation removed, are threaded through a double series of holes in the porcelain supporting block, in such a manner that when the copper contact or terminal pins are driven home and clinched at the back of the block all of the several wires of the cable are connected in series, the winding being divided by the contact-pins into seven sections of equal length.



REACTION COILS.

The operating key of the socket, which has its bearing in the porcelain block and projects through an opening in the enclosing shell, is provided with a contact-arm that moves over the series of terminal pins on the working face of the block, and by including a fewer or greater number of the coil sections in the lamp filament circuit diminishes or increases the counter electro-motive force developed by the coil, and thus raises or lowers the light. In other words, when by the movement of the arm over the contact-pins the length of wire in series with the lamp filament is reduced, the self-induction in the wire due to the presence of the iron core is diminished, and more current is allowed to flow to the lamp, thus increasing its brilliancy. When the arm is moved in a direction to increase the active length of wire in series with the lamp, the self-induction or counter electro-motive force set up in the copper wire is increased, thereby permitting a proportionately smaller current to flow to the lamp, causing a diminution in the light.

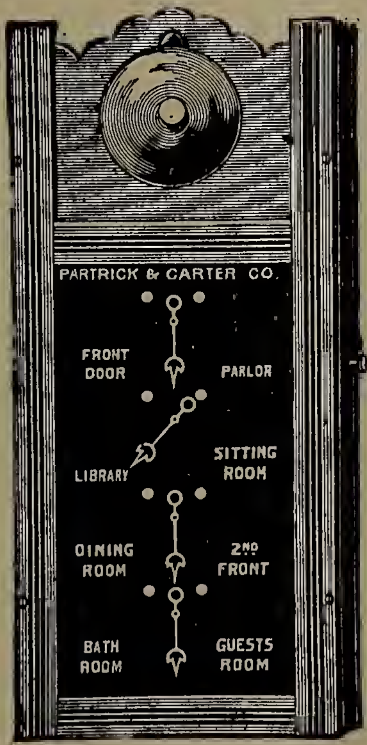
Heretofore it has been necessary in ordering sockets of any type to specify the particular make of lamps for which they were desired, or to carry in stock a varied assortment of sockets adapted to the leading makes of lamps. This is now obviated by the new universal base shown in Fig. 2, with which the improved Ries Regulating Sockets are provided.

In conclusion, it may be said that experience has shown that the Ries Regulating Socket supplies what has been aptly called "the missing link" in incandescent electric lighting, and with the improvements that have recently been made in its mechanical construction, the demand for this specialty, which is already very large, bids fair to become so great as to make it a most powerful factor in the future growth and development of the electric-lighting industry.

NEW ANNUNCIATOR.

The ordinary annunciator is all right when it receives proper attention, but if it is neglected, as it often is, it causes confusion and uncertainty. In most instruments of this character it is necessary to reset the drop by hand after a call has been announced. Failure to do this necessarily causes uncertainty and delay when a second or more calls are made. It is impossible then to tell whence the last call proceeded.

In order to overcome these difficulties the new " Automatic Set-Back Annunciator " was devised by the Partrick & Carter Co., Philadelphia, Pa. This instrument externally looks like the other dial annunciators made by this company, but it possesses the valuable feature of causing the drop to be reset automatically, and in indicating only the last call. For instance, a call comes from the parlor, and one follows from the library; the call from the library will automatically reset the pointer of the parlor call to its normal position, and indicate its own. It is evident, therefore, that the annunciator need never be touched, as it always shows whence the last call came.



NEW ANNUNCIATOR.

It is a simply constructed device, and, consequently, durable, and the advantages of its use are so obvious that little need be said concerning them.

They are made in various kinds of woods, and are certainly a great improvement on the old-fashioned annunciators.

BELTS—THE INFLUENCE OF SPEED—DIMENSIONS OF PULLEYS.

BY CHARLES A. HAGUE.

We see by far too many pulleys disproportionately small, or running too slow for the work they are expected to do. A belt, to work to advantage, must have a high velocity ; and to attain this, either pulleys of large diameter must be employed or the shaft must have a high rate of revolution.

Horse-power is a certain number of foot-pounds developed per minute ; and as foot-pounds are simply pounds of pressure or strain multiplied by velocity in feet travelled, it follows that the greater the speed the less will be the required strain to produce any certain horse-power. This minium of power brings benefits with it, as reduction to lowest terms of pressure on shafting and consequent reduction of friction, both from direct pressure and from springing due to heavier pressure. A light pressure upon a journal also prevents the oil being forced out from between the journal bearings. The pulleys necessary to high belt speed present a greater value of surface for holding the belt to its work.

There are an almost endless number of conditions resulting from the pulley question. We have repeatedly witnessed the breaking of shafts from excessive cross-strain, caused by over-tight belts, and have seen the breaking prevented, oil saved, power economized and repairs rendered unnecessary by simply increasing the diameter of the pulleys. The shafting not only suffers, but the belting and fastenings come in for a large share of the general affliction. Where small pulleys are used, and the belt is exceedingly taut, it is often necessary to secure the ends of the belt by an over-lapping patch, laced or riveted ; whereas, by employing proper-sized pulleys the belt may be held by the ordinary method of lacing. The principle of foot-pounds is the correct one to apply to belt speed and pulley sizes, but it may be more convenient to some to look at the question in the light of leverage. With a shaft running at 200 revolutions per minute it will certainly be easier to turn it by means of a four-foot lever (pulley radius) than by one only two feet long ; but the pulley circumference, multiplied by 200, gives the feet of travel per minute, and this result, multiplied by the pressure required at the pulley rim to keep the shaft up to speed, will exhibit the foot-pounds expended per minute to run the shaft.

This matter of reducing the action of a belt and pulley to its foundation principles of a certain number of pounds of pressure operating at a certain rate of motion, or, in other words, the science of transmitting power by belting, is not grasped comprehensively anything like as generally as it should be. Men are quite often met with who fancy that a steam-engine should have a balance-wheel considerably larger than the pulley upon the crank-shaft by which the engine is belted to the machinery ; and that belting from the rim of the balance-wheel itself is most pernicious, because in some unexplained manner the engine is choked down or held back.

(*To be continued.*)

MR. JOHN W. MACKAY SHOT.

Mr. John W. Mackay, president of the Commercial Cable Company, was shot by an insane mining stock speculator in San Francisco on February 24. The ball struck Mr. Mackay in the back and was afterwards extracted. At last reports Mr. Mackay was doing well; at no time was the wound considered dangerous. His assailant, M. C. Rippey by name, shot himself after firing at Mr. Mackay, with probably fatal results.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Bradford, Pa.—The question of lighting this town by electricity is being agitated.

Dalton, N. H.—The Coos and Grafton Electric Light, Heat and Power Company will construct an electric-light plant here as soon as the frost is out of the ground so that work can be commenced. W. R. Porter, of Lancaster, is interested.

Ithaca, N. Y.—Edward C. Hance has been granted the right to string wires along such streets of this city as is necessary for the purpose of establishing electric calls in connection with the city messenger service.

NEW CORPORATIONS.

Camden, Me.—The Belfast, Camden and Stockton Railway Company has petitioned for incorporation. Incorporators: J. Manchester Haynes, George E. McComber, of Augusta; Charles P. Mattocks, of Portland; and Henry L. Mitchell, of Bangor.

Chicago, Ill.—The Adams Electric Manufacturing Company. Capital, $500,000 Incorporators: William B. Mather, William L. Southerland, and James S. Wheeler, Jr.

Claremont, N. H.—The Claremont Street Railway Company has petitioned for incorporation.

Columbus, Neb.—The Plattsmouth Motor Power Company. Capital, $500,000.

Dalton, N. H.—A petition for incorporation has been presented by the Coos and Grafton Electric Light, Heat and Power Company.

Glenville, Conn.—The Portchester and Glenville Tramway Company has petitioned for incorporation.

Greenwich, Conn.—An application has been made for the incorporation of the Greenwich Tramway Company.

Haverhill, N. H.—The Moosilauke Electric Railway Company has petitioned for incorporation.

Manchester, Conn.—Petition has been made for the incorporation of the Manchester Light and Power Company.

Manchester, N. H.—The Cascade Electric Light and Power Company has petitioned for incorporation.

The Bartlett Electric Light and Power Company has applied for incorporation.

The City and Surburban Street Railway Company has petitioned for incorporation.

Application has been made for the incorporation of the Unconoonuck Electric Railway Company.

Matfield Green, Kan.—Matfield Green and Bazar Telegraph and Telephone Company. Capital, $400. Incorporators: H. S. Lincoln, John Carnes, B. F. Talkington, P. J. Heeg, Levi Jones, E. A. Hildebrand and A. R. Palmer.

Milford, N. H.—The Milford Electric Light Company has petitioned for incorporation.

Norwalk, O.—Norwalk Electric Company. Capital, $50,000.

North Hampton, N. H.—The Rye Beach Electric and Horse Railroad Company has made application for incorporation.

Plaistow, N. H.—A petition has been made for the incorporation of the Plaistow and Haverhill Electric Railroad Company.

Salem, N. H.—A petition has been made for the incorporation of the Salem and Pelham Street Railroad Company.

A petition has been made for the incorporation of the Salem and Derry Street Railway Company.

Stoneham, Mass.—Application has been made for the incorporation of the Malden, Melrose and Stoneham Street Railway Company.

Superior, Wis.—The Superior-Duluth Terminal and Transfer Railway Company. Incorporators: Day K. Smith and A. Harrington of the Duluth Transfer Company and H. H. McIntire of the South Superior Improvement Company.

Washington, D. C.—A bill has been introduced to incorporate the Washington Traction Company. Incorporators: Thomas F. Barrett, John S. Johnson, Abraham R. Wingate, Burr R. Tracy, John A. Carr William A. Richards and W. Woodville Flemming.

West Chester, Pa.—The Citizens' Railway Company of Chester County. Capital, $80,000. Directors: William P. Snyder, T. L. Eyre, William G. Pennypacker and Joseph H. Baldwin. President, Thomas Pennypacker.

West Fairview, Pa.—Fairview and Riverton Passenger Railway Company. Capital, $25,000. Directors: Henry McCormick, James M. Cameron, Harry B. McCormick, Frank Martin and Lemuel Spong.

Wilmington, Del.—A charter has been asked for by the Wilmington and Chester Electric Railway Company.

NEW ROADS.

Biddeford, Me.—A charter has been asked for an electric railway to extend from this city or Saco to Fryeburg, with a branch to Gorham.

Calais, Me.—The Calais Street Railway Company has been formed to construct a street railway here.

Hopkinsville, Ky.—There is a project on foot to construct and operate an electric railroad in this city. Mr. J. N. Alsop, of Owensboro, is interested.

Hopkinton, Mass.—The selectmen have granted a franchise for an electric railway from this town to South Framingham.

Middletown, Md.—A project is on foot to construct and operate an electric road from this place to Frederick.

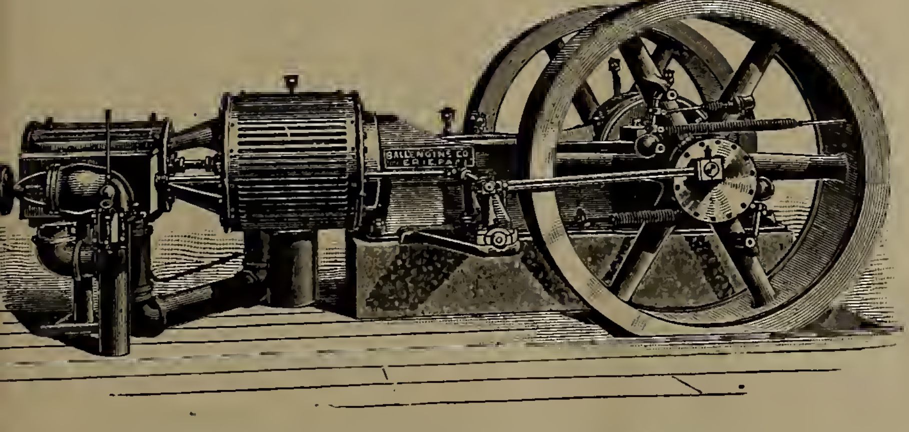
LARGE ORDER.—It is reported that the Westinghouse Company has closed a contract to furnish the Lindell electric line in St. Louis Westinghouse generators with a total capacity of 2,000 H. P., also a contract for 80 car equipments in Jersey City.

A NEW publication, *The Electrical Worker*, has been started in the electrical field. This is a monthly journal published in St. Louis, Mo., and is the official organ of the Brotherhood of Electrical Workers. From its avowed object, its circulation will be mostly among the actual workers in electricity.

TANDEM-COMPOUND ENGINE.

This engine is of 400 H. P. capacity and is an outgrowth of the experience of the Ball Engine Company, Erie, Pa., in the manufacture of engines of smaller capacity adapted to the work of driving street-railway generators, the demands from this service for economical motive-power within small space and safety of operation being such that this type of engine is now found to be a winning competitor with single cylinder "Corliss" engines of 28″ x 48″ to 26″ x 60″ cylinder capacity and wheel diameter of 20 feet. In this engine the stroke is made short for the purpose of raising the number of revolutions and reducing the wheel diameters so as to more nearly approach the diameters of the generator pulleys, giving better belt contact. The range of wheel diameters is from 80 to 112 inches, which enables the engine to drive directly on to the pulleys of the different makes of generators without the intervention of line shafts or other devices for raising the lineal velocity of the belts, this being accomplished within economical ranges of piston speed, *i.e.*, 600 to 700 feet per minute, and perfectly reasonable as well as economical steam pressures, *i.e.*, 100 to 115 lbs.

The engine herewith illustrated is one of several which have been put in operation within the past year. It is perfectly balanced and does not require the enormous foundation which its slow-speed competitor is obliged to have, one of them giving the most satisfactory results at a speed of 210 revolutions on a pier of its own length, 17 feet high, piercing a comparatively light engine-room floor, 14 feet pitch from the basement floor, on which is located all of the steam-plant outfit other than the engines and dynamos. This engine is endowed with great strength, rigidity and long-living powers, owing to the form of the frame, shaft, cylinders, heads and reciprocating parts, the latter, with the exception of the pistons and wrist-pin boxes, being of forged steel from tip to tip. The shaft is of one solid piece of forged steel. The high-pressure valve motion is derived from the governor, while the low-pressure valve is driven by direct connection from an eccentric on the other side of the engine, this eccentric being adjustable for the purpose of making a more perfect adaptation of the engine to its load when the actual running conditions are demonstrated. The valves, of the "nearly" balanced type, are absolutely steam-tight, and will remain so indefinitely, as the wear is so trifling that a few hours of scraping will renew the faces as good as when first started, after two or three years' run of 10 to 18 hours per day. The general features of the engine are suggestive of correct location and distribution of the parts and materials involved.


BALL ENGINE CO ERIE PA

400 H. P. TANDEM-COMPOUND ENGINE.

The engine shown in our illustration has 18″ high-pressure and 30″ low-pressure cylinders, with 18″ stroke of pistons, carrying two wheels of 96″ diameter by 25″ face, weighing 10,000 lbs. each, giving a fly-wheel capacity and efficiency equivalent to more than double their weight if made into a 20′ wheel for a 60″ stroke engine, making under one-third as many revolutions. It is being demonstrated in this plant that with a regulation giving an increase of speed of 1% from empty generators to full capacity (350 k.w.) the voltage taken at 480 when no current is being used will follow the increase of engine speed almost exactly up to the maximum of 500 for full load.

STRIKE OF WIREMEN.

One hundred electrical wiremen employed at the World's Fair grounds, Chicago, struck work on February 23 because their demands for an increase of 50 cents a day in their wages, time-and-a-half for over-time and double time for Sunday work were not acceded to. The authorities having the work in charge state that they will not be embarrassed by the strike as they can get all the men they need at the old prices.

TELEGRAPH DEPARTMENT.

The Chinese government is making preparations to extend its telegraph system to Kashgaria.

The Attorney-General of New York State has been applied to for the annulment of the charter of the Magneto Telegraph Company, on the ground that the company has suspended business for a year and has made no reports to the Secretary of State. The company was organized August 28, 1885, with a capital of $5,000,000. In the complaint it is charged that the company has never owned or built a telegraph line in this State and that the stockholders have not been given any information regarding the condition of the business.

On March 1 the Commercial Cable Company reduced its rate from New York to all stations in China, except Macao, but including the islands of Formosa and Pescadore. The rate, which is uniform, is $1.96 per word.

A despatch from St. Paul, Minn., states that ten operators were discharged by the Western Union Telegraph Company in that city on February 23 without previous notice. It is stated that the discharged men belong to the telegraphers' organization and they think that this fact has something to do with their dismissal.

NEW BOOKS.

How to Manage the Dynamo. By S. R. Bottone. New York and London: Macmillan & Co., 1893. Cloth, illustrated. Price, 60 cents.

At this time, when almost every large manufacturing industry is introducing some system of electric lighting into its factory, and when almost every large building, for whatever purpose it is intended, is now being lighted by electricity, there comes the necessity of competent persons to take charge of its lighting plant. Engineers are employed in these large buildings to run a steam or other heating plant, and it often devolves upon these same engineers to look after the dynamo. It therefore becomes important that they familiarize themselves with the construction and management of such mechanisms. The author of the above book has endeavored to put in concise form such information as would be necessary for the successful operation of these apparatus. After a general description of the dynamo the book treats of the precautions and methods of installation, and then discusses the more important inherent defects. The work is well adapted for the practical engineer who suddenly finds himself called upon to take charge of a dynamo, whether for lighting or electro-deposition.

Engine-Room Chat. By Robert Grimshaw, M.E. New York: Practical Publishing Company. Cloth, illustrated. Price, $1.00.

Among the mass of books upon technical subjects that are constantly being introduced to the public, there appears now and then a work which is not intended to be of a scientific character; on the contrary, it is for the amusement of scientific men. Such is the purpose of the above publication. The book consists of a series of short stories and incidents, written in a popular style, by means of which many a scientific and moral point is forced upon the attention of the reader. While the book will be of interest to any one who desires to read it, the ideas appeal more particularly to those interested in the generation of power, and especially those who are charged with the care of engines and boilers.

Water-Tower, Pumping and Power Station Designs. Prize designs. New York: The *Engineering Record.*

The book is handsomely gotten up. The designs are distinct and printed on one side of each leaf. There are many suggestions which will be found useful to any one desiring to construct a pumping or power station. These designs are drawn by the winners of four prizes offered by the *Engineering Record*, together with thirteen others who received honorable mention in the competition. The general changing of the power of street railways to electric or cable power renders suggestions in regard to power-houses of great value, for a power-station in a city or village ought to be looked upon as an ornament, and the expense of beautifying these buildings would not be great if the ingenuity of some talented architect be brought into play. The suggestions contained in this book are of a general nature, as the designs were made with no particular place in view. The price of this book is $2.00.

Logarithmic Tables. By Prof. George W. Jones, of Cornell University. Fourth edition. London, Macmillan & Co.; and Ithaca, N. Y., George W. Jones. 1893. Cloth, 160 pages. Price, $1.00.

This book has been very popular in the past, and with the corrections and revisions of the fourth edition its usefulness is necessarily increased. The pages are large and the type used is easy to read without the straining of the eyes which has been a great fault with other logarithmic tables. There are eighteen separate tables, the use of which is clearly explained in the fore part of the book. This work is not only prepared for the class-room but is also specially adapted to the practical workings of the laboratory.

"From Darkness to Light" is the title of a book just published by Terence Duffy, of San Francisco, Cal. The work consists of Duffy's compendiums of Nature's law, forces and mind combined in one, comformable to "his discovery" that the sun and earth are the poles of nature's magnet. It explains the motion of the earth, how the earth is maintained in space, and what force is, and purports to answer the mysterious question, "What is magnetism and electricity?" Mr. Duffy also attempts to explain all the varied phenomena of physical being, and what life is and how it is sustained.

These books, as well as all others on electrical and kindred subjects, can be obtained of the Electrical Age Publishing Co., World Building, New York city, on receipt of price.

BOOKS RECEIVED.

Proceedings of the Electrical Section of the Franklin Institute, Philadelphia, Vol. II., January to December, 1892.

Bound copy of the report of the proceedings of the 15th Convention of the National Electric Light Association, which was held in Buffalo, N. Y., February 23, 24 and 25, 1892.

ELECTRICAL SOCIETIES.

ELGIN ELECTRIC CLUB.

On January 24, 1893, the Elgin Electric Club, of Elgin, Ill., was organized, and the following named gentlemen were elected to the various offices for the ensuing year: President, Fred'k Purdy; vice-president, Dr. G. L. Marion; secretary, J. Frank North; treasurer, Henry Klinder; librarian, R. W. Pinkerton.

The objects of the club are to facilitate the interchange of ideas; by practice and example to acquire ease and fluency of address, and to obtain the advantages accruing from united efforts in providing means for scientific investigation. The membership of the club now numbers 48, and new applications are presented at each meeting.

The club meets every Saturday evening, and it is the ambition of the members that it shall attain a prominent place in the electrical world. Its objects are laudable ones, and should be heartily supported by its members.

The Electrical Age's Illustrated Record of Patents.

Issued February 28, 1893.

492,394. Insulator-Bracket. William N. Eichberg, Chicago, Ill. Filed Nov. 28, 1892.

492,402. Electric Train-Controlling Apparatus. Frank E. Kinsman, Plainfield, N. J. Filed Feb. 24, 1892.

492,422. Battery-Jar. James F. McLaughlin, Philadelphia, Pa. Filed June 2, 1890.

492,456. Switch for Operating Shunt-Wound Electric Motors. Frederick H. Berry, Milwaukee, Wis. Filed March 3, 1892.

492,467. Long-Distance Electric Telephony. Charles M. Haynes, Omaha, Neb. Filed Jan. 12, 1892.

492,471. System of Combined Telephony and Telegraphy. Frank A. Pickernell, Newark, N. J., assignor to the American Telephone and Telegraph Company, of New York. Filed April 29, 1892.

492,478. Electric Burglar-Alarm. Charles F. A. Sturts, San Francisco, Cal. Filed Sept. 30, 1891.

492,480. Transformer and Means for Developing Rotary Magnetic Fields. Charles S. Bradley, Avon, N. Y. Filed March 17, 1892.

492,482. Signalling Apparatus and Circuit. Edward J. Hall, Morris, and Frank A. Pickernell, Newark, N. J., assignors to the American Telephone and Telegraph Co., of New York. Filed Oct. 13, 1892.

492,483. Busy-Signal for Telephone-Circuits. Edward J. Hall, Morris, and Frank A. Pickernell, Newark, N.J., assignors to the American Telephone and Telegraph Company, of New York. Filed Oct. 13, 1892.

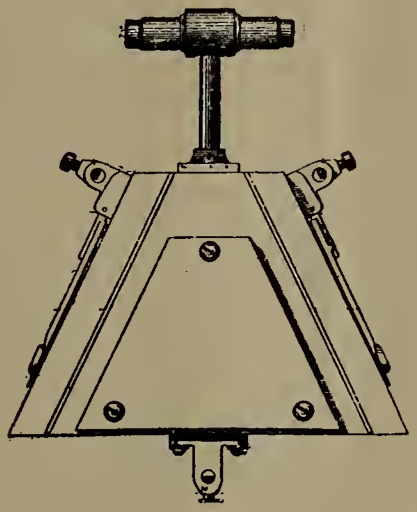
492,484. Telephone Central-Station Circuit. James L. McQuarrie, Boston, Mass., assignor to the American Bell Telephone Company, same place. Filed Sept. 8, 1892.

492,486. Coin-Controlled Machine for Administering Electricity. William R. Pope, New York, N. Y., assignor to the National Electric Machine Company, same place. Filed Aug. 13, 1892.

492,497. Electric Signalling Apparatus. William H. Kenyon, New York, N. Y., assignor to the Hall Signal Company, of Maine. Filed June 3, 1892.

492,519. Electrical Annunciator. John R. Hard, New York, N. Y. Filed Oct. 8, 1892.

492,524. Electric Motor. Franklin H. Beers, Newark, N. J. Filed April 2, 1892.



492,544.—LIGHTNING-ARRESTER.

492,526. Multiple Switch for Overhead Trolley-Lines. William H. Brodie, New York, N. Y. Filed Sept. 29, 1892.

492,544. Lightning-Arrester. Charles F. Scott, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed July 29, 1892.

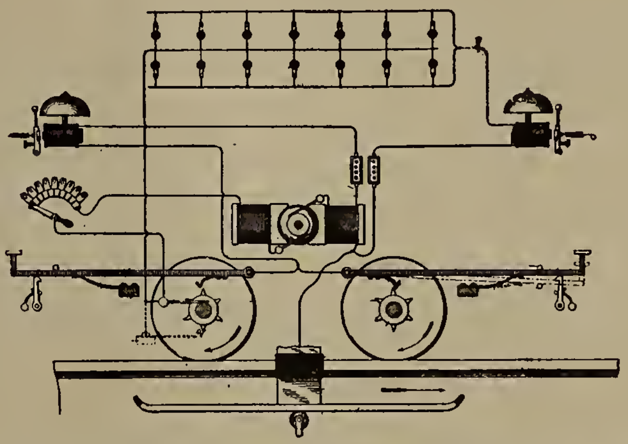
492,545. Electric Signalling Apparatus. Wesley Trafford, New York, N. Y. Filed Oct. 17, 1891.

492,547. Thermostatic Fuse Device. Alexander Wurts, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Jan. 14, 1892.

492,548. Lightning-Arrester. Alexander Wurts, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed March 12, 1892.

492,563. Keyed Musical Instrument Actuated by Electricity. Paris E. Singer, London, England. Filed June 17, 1892.

492,587. Telephone-Tablet. John R. Pruyn, Chicago, Ill., assignor of one-half to Charles J. Miller, same place. Filed Dec. 16, 1892.



492,627. — APPARATUS FOR ELECTRICALLY-PROPELLED CARS.

492,627. Apparatus for Electrically-Propelled Cars. Charles J. Kintner, New York, N. Y., assignor of one-third to Gustav Stahl, Philadelphia, Pa. Filed July 30, 1892.

492,633. Electric-Lighting System. Robert W. Rollins, Hartford, Conn. Filed Aug. 16, 1892.

492,646. Electric-Alarm Money-Drawer. William J. Walker, St. Louis, assignor of one-half to Alexander L. Bedford, Savannah, Mo. Filed Oct. 29, 1892.

492,648. Cable-Support. Gustave P. Wern Brooklyn, N. Y. Filed Sept. 30, 1892.

492,650. Electric-Arc Lamp. William P. Wiemann, Allegheny, Pa. Filed April 18, 1892.

492,681. Armature for Dynamo-Electric Machines. George Hoare, Newark, N. J. Filed March 24, 1892.

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HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician.

PATENTS.—Continued.

492,689. Relay. Jacob W. Lattig, Easton, Pa., assignor to the National Switch and Signal Company, same place. Filed Nov. 28, 1892.

492,694. Electric Alarm for Hotels. John McMurrow, Jr., Philadelphia, Pa., assignor of one-fourth to Charles S. Hirst, same place. Filed July 21, 1892.

492,713. Welding Metals Electrically. Charles L. Coffin, Detroit, Mich. Filed Oct. 29, 1892.

492,758. Rheostat-Plate. Charles E. Carpenter, Bridgeport, Conn., assignor to the Carpenter Enamel Rheostat Company, same place. Filed Oct. 27, 1892.

492,761. Cash Register and Indicator. William F. Z. Desant, New York, N. Y., assignor to the Desant Electric Company, same place. Filed April 25, 1892.

492,767. Production of Artificial Crystalline Carbonaceous Materials. Edward G. Acheson, Monongahela City, Pa., assignor to the Carborundum Company, same place. Filed May 10, 1892.

492,398. Closed Electric Conduit for Railways. Adolph Heiser, Chicago, Ill. Filed May 31, 1892.

492,457. Electric-Railway Block System. Francis O. Blackwell, Boston, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Feb. 15, 1892.

492,464. Railroad-Rail and Chair. Henry C. Evans, Brooklyn, N. Y., assignor to the Johnson Company, Johnstown, Pa. Filed Sept. 30, 1891.

492,472. Tramway-Switch. Joseph Y. Porter, Cleveland, Ohio, assignor to James W. Morrison, Detroit Mich. Filed Sept. 24, 1891.

492,492. Electric Car-Brake. Wendell C. Fletcher, St. Louis, Mo., assignor to Norman P. Willard, trustee, Chicago, Ill. Filed April 15, 1892.

492,525. Axle-Box Frame for Car-Trucks. John A. Brill, Philadelphia, Pa. Filed July 22, 1892.

492,645. Electric Railway-Signal. Howard St. C. Wait, New York, N. Y. Filed Aug. 11, 1891.

492,659. Electric Railway. Michelangelo Cattori, Rome, Italy. Filed July 23, 1892. Patented in Italy, in Belgium and in England.

492,727. Car-Truck. Peter M. Kling, St. Louis, Mo. Filed Nov. 9, 1892.

492,737. Conduit Electric Railway. James H. Bates, Hoboken, N. J. Filed Aug. 2, 1892.

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TELEGRAPHIC TOURNAMENT.

A telegraphic tournament will take place in this city on March 25, and a good deal of interest is manifested in it among telegraphers. It is a national affair, entries having been made from cities as far distant as San Francisco. John W. Mackay has offered special prizes.

FIRE-PROOF ELECTRIC-LIGHT STATIONS.

The recent destruction by fire of one of the stations of the Brush Electric Light Company, of Buffalo, N. Y., emphasizes the importance of constructing such stations in a fire-proof manner. Nothing of a combustible nature should enter into the construction of an electric-light station, particularly in large cities, where, usually, great dependence is placed upon uninterrupted current. Such disasters as these, while entailing heavy pecuniary loss on the operating company, are sure to engender a feeling of distrust and uncertainty upon the part of the consumers regarding the reliability of the supply of electric light. In order to build up public confidence in the light, if for no other reason, electric-light stations should be so constructed as to render it practically impossible to damage them by fire.

UNDERGROUND CONDUIT RAILWAYS.

An ingenious method of placing electric-railway conductors underground is that invented by Mr. F. C. Perkins, of Buffalo, and described and illustrated on another page in this issue. The great object to be attained in this class of railway construction is to prevent leakage from the conductors, and every electrical engineer knows the difficulties encountered in placing the wires beneath the surface; leakage is liable to occur in spite of everything that ingenuity has devised to prevent it. Mr. Perkins' idea is a novel one, and it would seem that leakage might be reduced to the minimum point. This system, however, like all others must demonstrate its practicability and merit by an actual test. There is a great need for a reliable and commercially successful method of laying electric-railway conductors underground.

THE TELEPHONE SITUATION.

On March 7 one of the Bell telephone patents expired after a life of 17 years. It was the patent upon which so much speculation was based, but there still exists considerable doubt as to whether it would be prudent to regard the telephone receiver as public property. There is another patent on the receiver still in existence, and it is this that is causing so much hesitation and doubt. It is asserted by many well-posted persons that the expiration of the March 7 patent does not remove from the telephone the protection that has been given it for the past 17 years, and that not before the 30th of next January will that instrument become public property, in the sense that it can be made and sold by any one who may choose to do so. It is safe to state that on the date last mentioned the telephone will surely become public property; but if any one takes the position that the patent which expired on March 7 removes the restriction and attempts to engage in the telephone business on that basis he may run up against the Bell telephone stone wall. Some express the belief that the Bell company might not molest any one who might wish to start a new telephone business, because in any event the monopoly cannot last longer than a few months more, and it might be a question as to whether the game would be worth the powder. The questions involved are of such a nature that the courts alone can say whether the telephone is now public or still private property. On the other hand, those desirous of starting new telephone companies perhaps can better afford to wait a few months than to take the chances of having a lawsuit on their hands, with a powerful monopoly as the complainant. The situation is an extremely interesting one, and from all the reports many embryotic telephone companies stand ready to jump into active existence the moment the clouds of doubt are dispelled.

THE EDISON PHONOGRAPH WORKS.

The Edison Phonograph Works are independent of the other establishments at Orange, N. J., though they are conveniently located near them. These works have a capacity of 500 machines a week. About 800 hands could be employed, though at present only about 250 are working. There is now considerable work being done for the World's Fair.

The works have the following departments for the manufacture of the different parts of the phonograph: the iron and brass foundries where fine castings are made; a blacksmith shop; a carpenter and pattern shop; nickel-plating, japanning and polishing rooms; the punch press-room where the dropping and punching operations are done; a screw-making department and precision-screw department, where screws of fine workmanship are made to be used in the recording and reproducing mechanisms; a drill-press department; and sapphire, wax cylinder and inspection departments.

Fig. 1 gives a general view of the main machine-shop, which is 350 feet long. Fig. 2 shows the electroplating department and Fig. 3 the testing and assembling room.

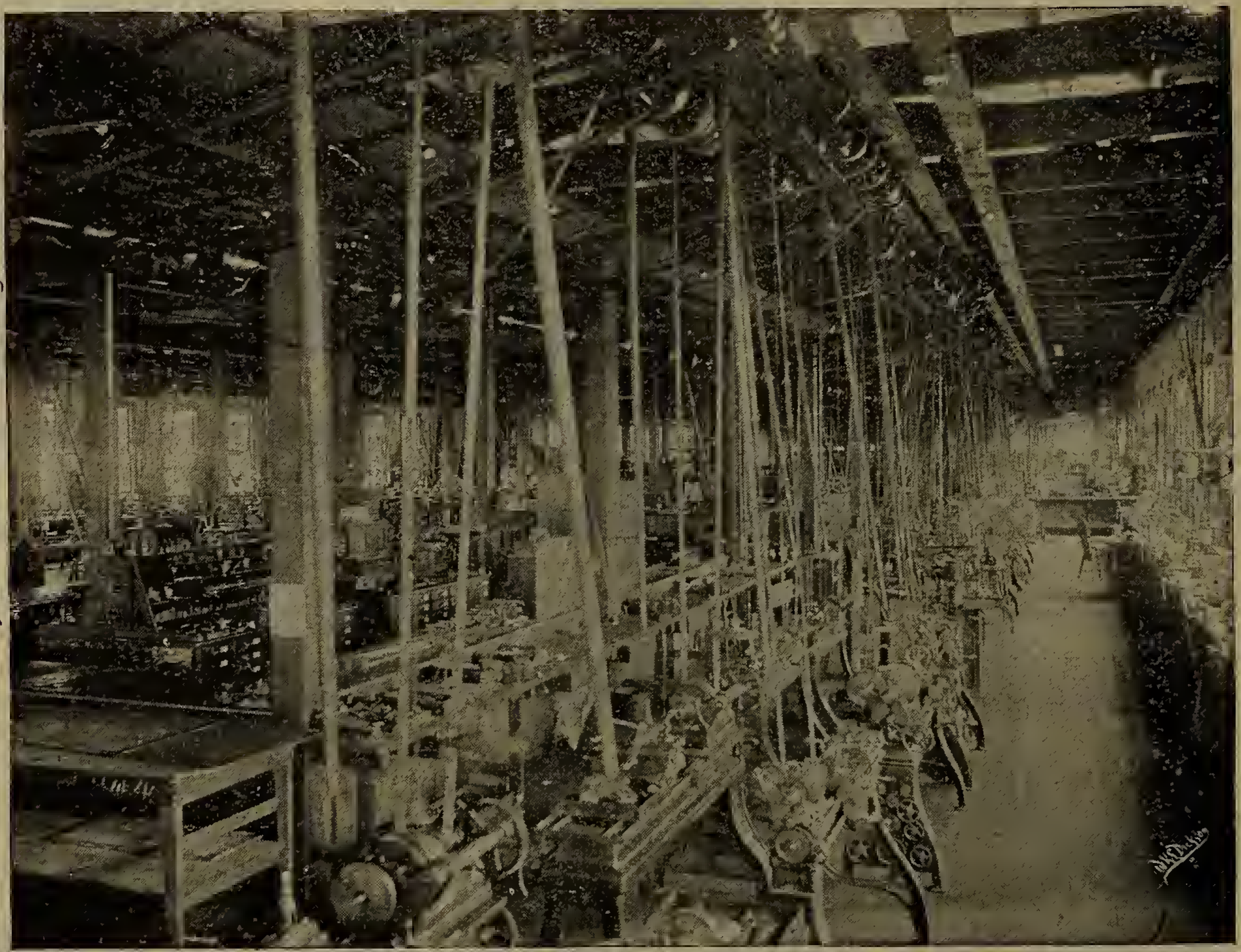


FIG. 1.—EDISON PHONOGRAPH WORKS.

All the recording and speaking parts of the phonograph are made in the sapphire room. The reproducer ball, the recording stylus and the turning-off knife are made from the best quality of sapphire. The rough stone is sawed into thin slabs about $\frac{1}{20}$ of an inch thick, and then into square pieces. Those which are to be used for the stylus and repruducer balls are concentrated into chucks, thus being ground and polished to the required diameter. The final polish is done by the use of a wooden or shell cap and very fine diamond powder. The cupping of the recorder stylus is a very difficult operation requiring long practice, and has to be done by the aid of a powerful microscope. The reproducer ball is first shaped by a diamond tool; then it is polished in a machine specially constructed so as to make the ball perfectly spherical. The pieces of sapphire that are to be used for the turning-off knife are cemented to a block, the flat sides being ground and polished. Then they are put into a special machine which gives them perfect cutting edges.

In the wax cylinder department one man only does the mixing of the wax, thus preserving the secret. After the component parts are ready the cylinders are moulded and then seasoned for about four weeks. They are then made ready for shipment.

There are four types of machines—the battery-motor machine is designated "M;" the one to run from an electric-light circuit, "E;" the water-motor machine, "W;" and the treadle machine, "T."

BELTS—THE INFLUENCE OF SPEED—DIMENSIONS OF PULLEYS.

BY CHARLES A. HAGUE.

(Continued from page 159.)

As an example, I call to mind a case in which it required a pretty sharp controversy to induce the presiding genius to relinquish the idea of placing a pulley considerably smaller than the balance-wheel upon the crank-shaft of the engine, belting from this pulley to a counter-shaft, and from the counter-shaft to the machine to be driven; the only reason for such an arrangement being that it would give the balance-wheel a certain amount of "leverage" over the belt-pulley. The idea seemed to be lost sight of, or perhaps was not entertained, that the power transmitted was simply so many foot-pounds, obtained by multiplying the resistance of the belt by the speed at which it travelled, and that the slower the speed of the belt the greater the pressure must be to obtain the same product.

The science of transmitting power from a steam-engine by means of a belt is embodied in the following: In the first place, an engine which is in good proportion to its load will develop and transmit a certain power independently of the manner in which it is connected to its load. The manner of connection determined, mainly, how much power shall be used in friction of engine and belt, and how much net power shall go to the machinery to be driven. The diameter of a belt-pulley upon the engine-shaft is independent of every and all considerations, except obtaining a high belt speed, and all conditions of transmission can be so reduced that the belt speed and balance-wheel requirements coincide.

If the engine is of insufficient power, or its balance-wheel is not heavy enough, or its rate of revolution is too slow, or the regulating apparatus is incompetent, the delivery of energy through the belt will be unsteady, no matter how the connection is made. The whole compass of the object in view is to get the most power, in proportion to the engine, in the steadiest manner just where it is wanted; and the method, which is the most direct under the conditions, conforms most closely with science and sense.

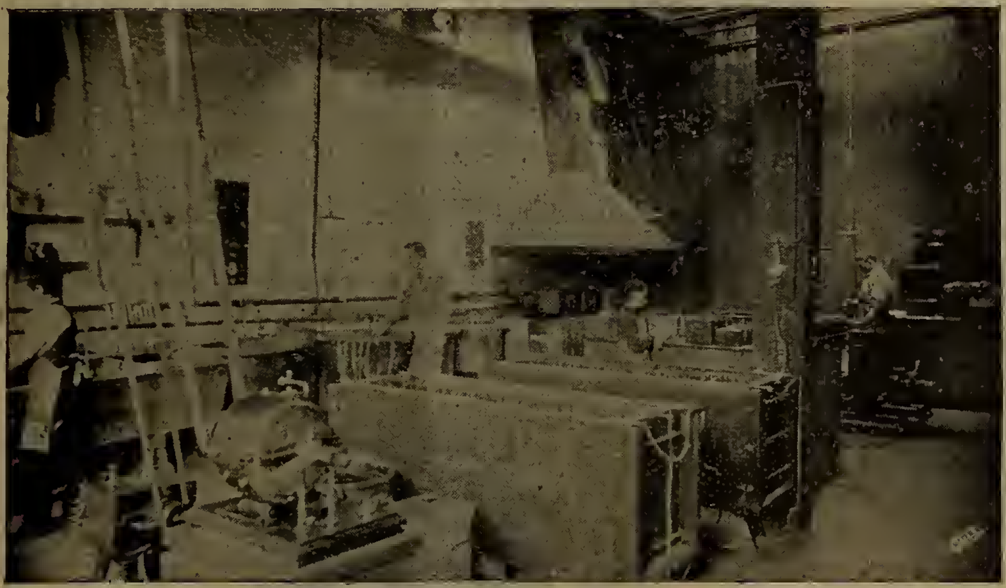


FIG. 2.—EDISON PHONOGRAPH WORKS.

The idea of "leverage" is, no doubt, the prominent one with such as advocate the large balance-wheel and small pulley plan, and to those people it may be remarked that the question of leverage does not enter into the principles of dynamic energy; and if they would recognize this fact and lay aside completely the leverage idea, to begin with, and then absorb the idea that dynamic energy or power is simply two factors multiplied together, they would stand some chance of looking at this important matter in a clearer light. The factors to be multiplied together are force and motion. In transmitting power by a belt the force is the resistance to slipping of the belt upon the pulley, and the motion is the speed of the belt. It must be obvious that in considering these two factors they are independent of everything else. If the machinery does not run properly, and it is the fault of the belting, then one or the other of these two factors is wrong; and they are so curiously blended that if one is wrong the other is wrong. That is, if the resistance to slipping of the belt upon the pulley is insufficient to either drive the load upon the second pulley or prevent the driving-pulley from slipping around within the belt, a change of belt speed by enlarging the second pulley and increasing the speed of the engine will increase the value of both the factors by reducing the resistance necessary upon the pulley and by increasing the rate of motion. To demonstrate this matter in figures we will suppose that a certain belt will incline to slip a little in endeavoring to transmit $7\frac{1}{2}$ horse-power. The belt is running at a speed of 3,300 feet per minute, and the resistance upon the pulleys is about 75 pounds. The two factors here to be multiplied are 3,300 feet travel and 75 pounds resistance, giving 247,500 foot-pounds, or $7\frac{1}{2}$ horse-power. We find that the belt is not quite equal to the task, so, by enlarging the second or driven pulley and increasing the engine speed to bring the driven shaft up to the speed it was at first running, we increase the belt speed to 4,400 feet per minute, and to drive $7\frac{1}{2}$ horse-power at this speed it will only require $56\frac{1}{4}$ pounds resistance upon the pulleys, thus securing a margin of safety of between 15 and 20 pounds in resistance. We now find that the belt running at 4,400 feet per minute and requiring a resistance of but $56\frac{1}{4}$ pounds will easily drive a load which it failed to drive when running 3,300 feet per minute and with a resistance of 75 pounds.

THE TROLLEY IN PHILADELPHIA.

Two bills have been introduced into the city councils of Philadelphia, Pa., providing for the substitution of the trolley system of propulsion for the present cable system. One was in the select council authorizing the Union Passenger Railway to dispense with the cable, and the other was in the common council authorizing the West Philadelphia and the Philadelphia and Darby street railway companies to make a similar change. In each case the bill was referred to the railroad committee of the chamber in which it originated.

It is proposed that a system similar to the one now in operation on the Catharine and Bainbridge streets line be constructed. It is provided that the companies shall enter into an agreement to keep and maintain in good order at all times all streets to be used by the trolley system before the Department of Public Safety shall issue permits for the construction of the trolley road. The roadbed, cars and the system in general are to be under the inspection of the Departments of Public Safety and Public Works, and it is further provided that the overhead trolley system shall be taken down and removed whenever the councils so desire.

FIG. 3.—EDISON PHONOGRAPH WORKS.

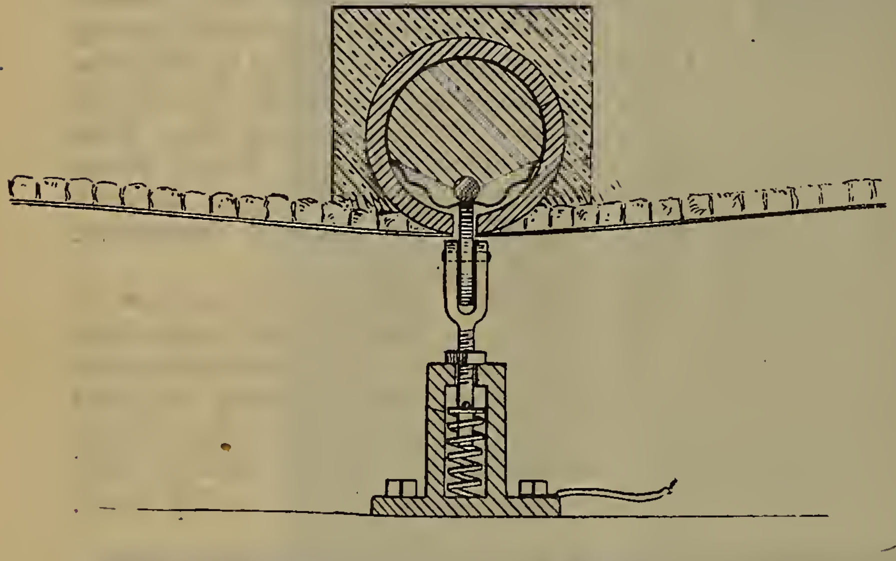
The system must be so constructed that it will not interfere with the building or operating of an elevated railway on any of the streets used by the companies. Work must be begun within six months, and the system must be in operation over the entire route within one year. Security in the sum of $25,000 must he given. All streets occupied must be repaved by the companies with Belgian blocks; such repaving is to be done from curb to curb, and for such length as shall be occupied by the poles and trolley wires. If such is not done with proper diligence the Department of Public Works is to complete the work at the companies' expense.

UNDERGROUND CONDUCTORS FOR ELECTRIC RAILWAYS.

The great need for an electric-railway system in which the electrical conductors shall be placed under the surface of the ground, and which will be reasonably economical to install and maintain and at the same reliable, may be inferred from the fact that patents almost without number have been issued of late on such ideas.

The two factors of prime importance to be considered and developed in a successful system are cheapness in installation and maintenance and minimum leakage, and many very novel ideas have been put into practical shape with the view of attaining these objects to the highest degree possible.

One of the latest inventions of this class is that of Mr. Frank C. Perkins, the well-known electrical engineer, of 629 Prospect ave., Buffalo, N. Y., an illustration and description of which follows.



PERKINS' ELECTRIC RAILWAY.

The bare conductor is mounted on the surface of an insulating material in a waterproof conduit, the upper part of which is rendered elastic by being constructed of sheet metal of sufficient thinness to permit of its being pressed into contact with the conductor by a travelling central device on the car, and the restoration to its normal shape when the car has passed.

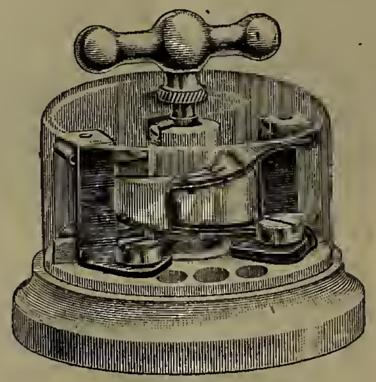
In the accompanying illustration the metallic tube is represented by the black continuous and circular line, the top part of which is corrugated for the purpose of affording greater flexibility. The conductor is seen on the top of the insulating material placed within the tube, and it is evident that if sufficient pressure be brought to bear on the outside surface of the tube, at the top, the top of the tube will be depressed until it touches the electrical conductor, and the current will be conveyed to the motor on the car through the presser-foot mounted on the car. The presser-foot is so constructed that the pressure may be varied at the will of the motorman by the pressure of his foot, and as the car proceeds along the road a shifting contact is maintained between the conductor and the car, the current being led to the motor by suitable connections.

The idea is to form the tube in convenient lengths to be joined after the manner of a telescope tube and the conductor may be insulated in various ways.

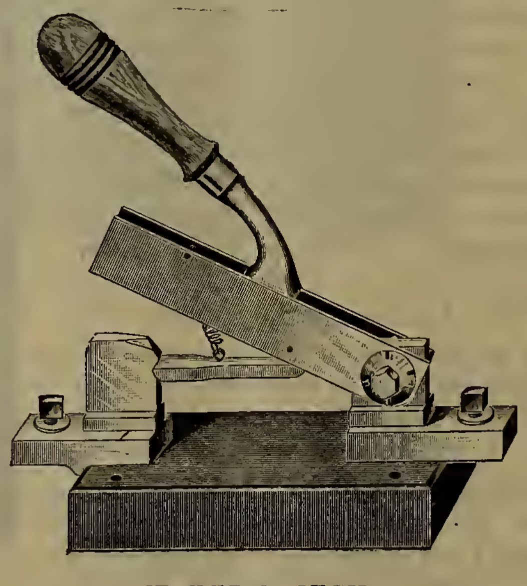
This method is equally adaptable to overhead construction, although it is particularly designed for underground conductors, and it is obvious that no current can be obtained on the outside of the tube until the top surface has been pressed into contact by the car itself with the conductor. The conductor being inaccessible otherwise all danger from shock is entirely obviated; no leakage can occur, and man and horse may walk over the conduit slot in all sorts of weather with impunity.

NEW SNAP AND FEEDER SWITCHES.

We illustrate a snap-switch of entirely new design, which owes its creation to the General Electrical Company. It differs radically from all other snap-switches which we have ever seen, and possesses intrinsic advantages of considerable value. The characteristic and distinguishing feature is the ratchet piece, which has four steps arranged in quadrants on both the upper and lower sides and revolves horizontally, two large and two small. One of these ratchet steps is covered with a copper strip passing across the porcelain to the corresponding steps on the other side of the ratchet-block. Two contact strips of hard spring copper, placed opposite to each other top and bottom on either side, bear upon the copper pieces on the ratchet when the circuit is completed. When the ratchet is revolved the copper spring pieces are slowly forced apart until the crest of the steps is reached, when they spring to the uncovered steps or quadrants instantaneously, rendering arcing impossible, and placing between them a barrier of porcelain insulation. A similarly forward movement instantaneously makes the circuit. The arrangement is similar to that in the ordinary plug-switch in which a solid mass of metal is inserted between contacts, and the circuit broken by its removal. In this switch the metal plug is withdrawn and instantaneously replaced by a porcelain plug. By the peculiar formation of the ratchet



SNAP-SWITCH.



FEEDER-SWITCH.

and the length of the copper brushes it has been found that the latter do not acquire a permanent set even after long use. These switches are made in the double-pole variety only, and are of the two patterns—the ordinary type and the flush-pocket style. The latter is adapted to insertion in wall pockets, and is then furnished with a decorative wall-plate. They are designed in capacities of 10, 25, 40 and 50 ampères. For simplicity of mechanism and certainty of operation this switch carries with it its own recommendation.

The General Electric Company has also just put upon the market a feeder-switch of an entirely novel design, presenting a reversal of hitherto accepted practice, and one from which many objectionable features present in former types have been eliminated.

In the switch in question, instead of a blade descending jack-knife-wise into receiving clips on a slate base the solid contacts are rigidly mounted on the base, and the clips operated by the handle come down one on each side of the contact-piece. The switch is so designed as to have all contact surfaces true, this being effected in one operation upon a machine especially devised for the purpose. The soldering of the clips into the lugs is done away with, the lug and contact-pieces being one homogeneous piece. The parallel clips are hinged to one contact-piece, and are also securely riveted to a piece of metal half way between the hinge and making end. To this piece is fastened the handle, which projects upward, and then forward at an angle of about 45 degrees.

The principal and most valuable characteristic of this switch is an almost perfect contact surface, having a low co-efficient of friction, with high conductivity, the two surfaces acting as if lubricated, minus the additional resistance of a lubricator. The split blade descending on the contact-pieces, yields uniformly, and thus makes an ideal contact.

A new method of breaking the circuit, differing radically from all others hitherto adopted, has been introduced in this switch, and no attempt has been made to bring the entire blade portion to a high velocity, as in other instantaneous switches.

The device by means of which the circuit is thus suddenly broken is a genuine innovation. It consists of a short brass bar fastened on the under side of the switch blades, one end pivoted near the middle of the blades, the other being held by a spiral spring, while on the side of the contact-post facing the hinge of the switch is a small projection. As the switch is opened the end of the small bar catches on this projection, and thus remains in full contact until after the blades have entirely left the contact-post. When the switch is well opened the bar slips off the contact-post and is drawn by the spring to its original position against the blades of the switch. By means of this ingenious device a sudden break is obtained; and as the connection is unbroken until after the blades have left the contact-piece, the contact surfaces of the switch do not suffer from arcing—two features of especial advantage in switches of this character. These switches are designed for use on circuits of a potential not exceeding 500 volts, and are made in capacities running from 30 to 1,500 ampères.

Obituary.—Mr. D. Herbert Jeffery, secretary of the Crocker-Wheeler Electric Company, of New York, died on March 2 of pneumonia, after an illness of 10 days. Mr. Jeffery was 41 years of age and had been connected with the above-named concern for the past two years. He had a large circle of friends in and out of the business who will be pained to learn of his death.

THE TELEPHONE PATENTS.

On March 7 last one of the so-called telephone patents expired by limitation, having run its full term of 17 years. This particular patent has been regarded by many as the fundamental telephone-receiver patent, but there seems to be considerable doubt in the minds of others as to whether this is true or not, and no doubt it will require the opinion of the courts to settle the matter. In any event, the opinion seems to be unanimous that the patent which expires on January 30, 1894, will release the telephone of all its fundamental patent protection.

The patent which expired on the 7th instant is on an "Improvement in Telegraphy," granted to Alexander Graham Bell, of Salem, Mass., and issued March 7, 1876, and while it relates to a method of multiple telegraphy, provision is made in the patent for the application of the instruments to other uses, such as the "simultaneous transmission of musical notes, differing in loudness as well as in pitch, and the telegraphic transmission of noises or sounds of any kind." It is right at that point where the patent covers the art of telephony.

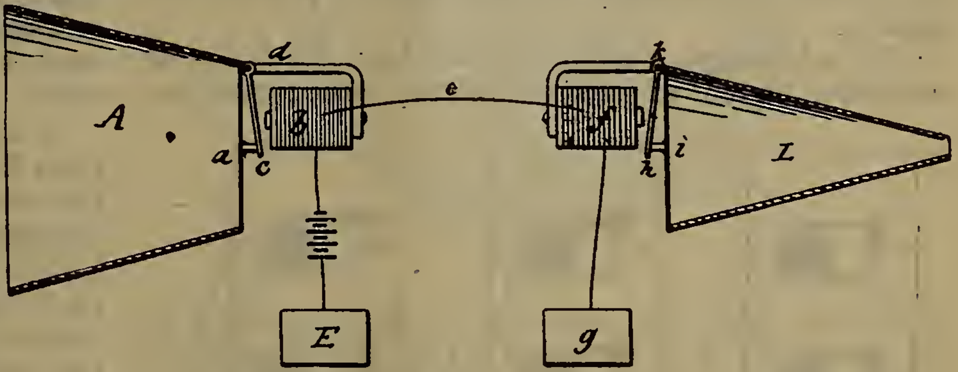


FIG. 1.

In view of the important relation of this patent to the telephone we feel justified in quoting a portion of Mr. Bell's specifications contained in his application.

"In letters-patent granted to me April 6, 1875, No. 161,739, I have described a method of, and apparatus for, transmitting two or more telegraphic signals simultaneously along a single wire by the employment of transmitting-instruments, each of which occasions a succession of electrical impulses differing in rate from the others; and of receiving-instruments, each tuned to a pitch at which it will be put in vibration to produce its fundamental note by one only of the transmitting-instruments; and of vibratory circuit-breakers operating to convert the vibratory movement of the receiving-instrument into a permanent make or break (as the case may be) of a local circuit, in which is placed a Morse sounder, register, or other telegraphic apparatus. I have also therein described a form of autograph-telegraph based upon the action of the above-mentioned instruments.

"In illustration of my method of multiple telegraphy I have shown in the patent aforesaid, as one form of transmitting-instrument, an electro-magnet having a steel-spring armature, which is kept in vibration by the action of a local battery. This armature in vibrating makes and breaks the main circuit, producing an intermittent current upon the line-wire. I have found, however, that upon this plan the limit to the number of signals that can be sent simultaneously over the same wire is very speedily reached; for, when a number of transmitting-instruments, having different rates of vibration, are simultaneously making and breaking the same circuit, the effect upon the main line is practically equivalent to one continuous current.

"In a pending application for letters-patent, filed in the United States Patent Office, February 25, 1875, I have described two ways of producing the intermittent current, the one by actual make and break of contact, the other by alternately increasing and diminishing the intensity of the current without actually breaking the circuit. The current produced by the latter method I shall term, for distinction sake, a pulsatory current.

"My present invention consists in the employment of a vibratory or undulatory current of electricity in contradistinction to a merely intermittent or pulsatory current, and of a method of, and apparatus for, producing electrical undulations upon the line-wire.

"The distinction between an undulatory and a pulsatory current will be understood by considering that electrical pulsations are caused by sudden or instantaneous changes of intensity, and that electrical undulations result from gradual changes of intensity exactly analogous to the changes in the density of air occasioned by simple pendulous vibrations. The electrical movement, like the aerial motion, can be represented by a sinusoidal curve or by the resultant of several sinusoidal curves.

"Intermittent or pulsatory and undulatory currents may be of two kinds, accordingly as the successive impulses have all the same polarity or are alternately positive and negative.

"The advantages I claim to derive from the use of an undulatory current in place of a merely intermittent one are, first, that a very much larger number of signals can be transmitted simultaneously on the same circuit; second, that a closed circuit and single main battery may be used; third, that communication in both directions is established without the necessity of special induction-coils; fourth, that cable despatches may be transmitted more rapidly than by means of an intermittent current or by the methods at present in use; for, as it is unnecessary to discharge the cable before a new signal can be made, the lagging of cable signals is prevented; fifth, and that as the circuit is never broken a spark-arrester becomes unnecessary.

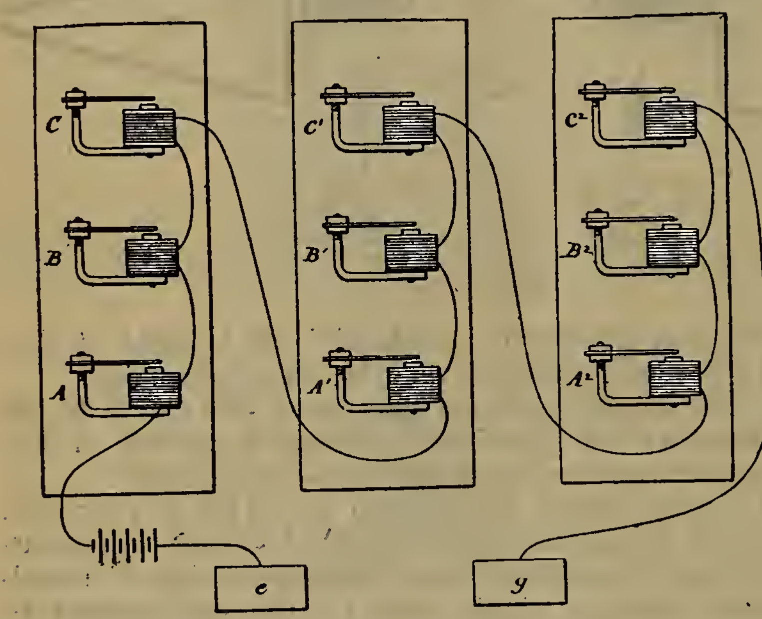


FIG. 2.

"It has long been known that when a permanent magnet is caused to approach the pole of an electro-magnet a current of electricity is induced in the coils of the latter, and that when it is made to recede a current of opposite polarity to the first appears upon the wire. When, therefore, a permanent magnet is caused to vibrate in front of the pole of an electro-magnet an undulatory current of electricity is induced in the coils of the electro-magnet, the undulations of which correspond, in rapidity of succession, to the vibrations of the magnet in polarity to the direction of its motion, and in intensity to the amplitude of its vibration."

Fig. 1 illustrates the method of connecting a number of instruments upon a telegraphic circuit, and their action is thus described:

"When the armature of any one of the instruments is set in vibration all the other instruments upon the circuit which are in unison with it respond, but those which have normally a different rate of vibration remain silent. Thus, if A is set in vibration, the armatures of A^1 and A^2 will vibrate also, but all the others on the circuit will remain still. So if B^1 is caused to emit its musical note the instruments B B^2 respond. They continue sounding so long as the mechanical vibration of B^1 is continued, but become silent with the cessation of its motion. The duration of the sound may be used to indicate the dot or dash of the Morse alphabet, and thus a telegraphic dispatch may be indicated by alternately interrupting and renewing the sound.

"When two or more instruments of different pitch are simultaneously caused to vibrate, all the instruments of corresponding pitches upon the circuit are set in vibration, each responding to that one only of the transmitting instruments with which it is in unison. Thus the signals of A are repeated by A^1 and A^2, but by no other instrument upon the circuit; the signals of B^2 by B and B^1; and the signals of C^1 by C and C^2—whether A, B^2, and C^1 are successively or simultaneously caused to vibrate. Hence by these instruments two or more telegraphic signals or messages may be sent simultaneously over the same circuit without interfering with one another."

In describing his method of creating electrical undulations Prof. Bell gives an illustration which is practically the same as that shown in Fig. 2 of the accompanying illustrations. This figure is the patent illustration used for the purpose of showing how motion "can be imparted to the armature by the human voice or by means of a musical instrument," and the construction and action of this instrument is described as follows:

"The armature *c* is fastened loosely by one extremity to the uncovered leg *d* of the electro-magnet *b*, and its other extremity is attached to the centre of a stretched membrane, *a*. A cone, A, is used to converge sound vibrations upon the membrane. When a sound is uttered in the cone the membrane *a* is set in vibration, the armature *c* is forced to partake of the motion, and thus electrical undulations are created upon the circuit E *b e f g*. These undulations are similar in form to the air vibrations caused by the sound—that is, they are represented graphically by similar curves.

"The undulatory current passing through the electro-magnet *f* influences its armature *h* to copy the motion of the armature *c*. A similar sound to that uttered into A is then heard to proceed from L.

"In this specification the three words 'oscillation,' 'vibration,' and 'undulation,' are used synonymously, and in contradistinction to the terms 'intermittent' and 'pulsatory.' By the terms 'body capable of inductive action,' I mean a body which, when in motion, produces dynamical electricity. I include in the category of bodies capable of inductive action—brass, copper, and other metals, as well as iron and steel."

Prof. Bell then sets forth the ground of his patent in the following claims:

1. A system of telegraphy in which the receiver is set in vibration by the employment of undulatory currents of electricity, substantially as set forth.

2. The combination, substantially as set forth, of a permanent magnet or other body capable of inductive action, with a closed circuit, so that the vibration of the one shall occasion electrical undulations in the other, or in itself, and this I claim, whether the permanent magnet be set in vibration in the neighborhood of the conducting-wire forming the circuit, or whether the conducting-wire be set in vibration in the neighborhood of the permanent magnet, or whether the conducting-wire and the permanent magnet both simultaneously be set in vibration in each other's neighborhood.

3. The method of producing undulations in a continu-

ous voltaic current by the vibration or motion of bodies capable of inductive action, or by the vibration or motion of the conducting-wire itself, in the neighborhood of such bodies, as set forth.

4. The method of producing undulations in a continuous voltaic circuit by gradually increasing and diminishing the resistance of the circuit, or by gradually increasing and diminishing the power of the battery, as set forth.

5. The method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sound, substantially as set forth.

THE STOREY MOTOR.

Until a very recent date the electric motor has simply been used to supply the place of engines and other motive-power in operating the ordinary methods of power transmission—that is, by means of shafting and belting. In this means of operating any plant the improvement in the use of electricity has simply been in convenience and economy of space, no general economical points being gained. The study of electricity by engineers has been in the line of a closer application of this power, but the objections generally met in form and exposure of parts of all the ordinary types of motors have made the solution of this problem apparently both difficult and distant. Recognizing these features in the experiences of other experimenters in this interesting field, Mr. I. E. Storey, the inventor of the motor which is the subject of this article, early in 1886 in the mines of Colorado, turned his attention especially to the protective elements necessary to reach a satisfactory solution. His first effort in this line was in the production of a motor for the direct driving of a mining drill in which all the ordinary disadvantages of electrical application of power were met under exceptionally difficult conditions, with the added trouble due to the extreme moisture and dirt of all characters common to mining work. This first effort was a complete success, and this success led naturally to the consideration of the general adaptation of the principle to other lines which cannot fail to suggest themselves to any intelligent mind whose study has been at all in this direction. Following out his original intention, the inventor has since produced and protected by letters-patent in the principal countries of the world a type of motor unique in form, of the highest quality of mechanical detail, possessed of a maximum of electrical efficiency in proportion to the weight of material and entirely free from the common defect—magnetic leakage—making a distinct advance compared to anything yet produced in this branch of electrical science.

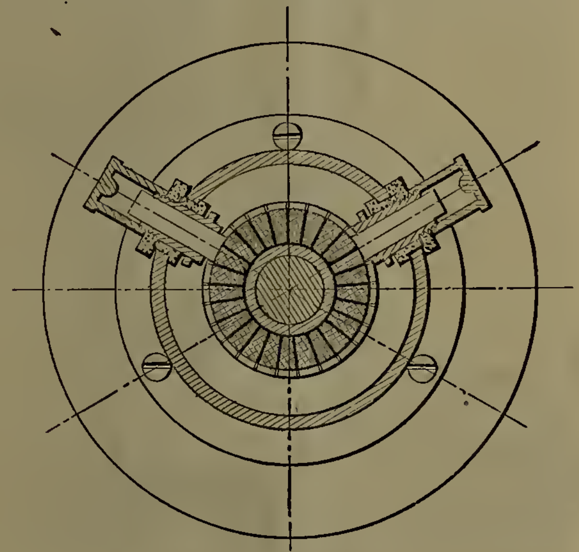


Fig. 4

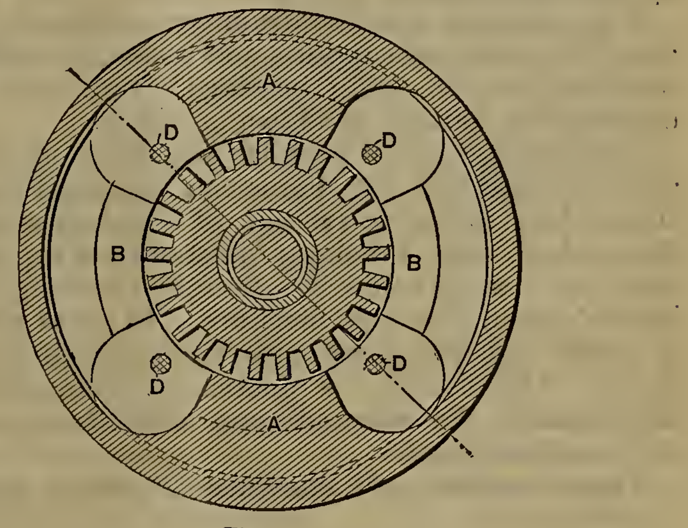


Fig. 3

This motor is a plain cylindrical machine having end projections for the boxes and commutator.

Fig. 1 represents a longitudinal section through T-shaped pole-pieces, which project internally from the cylindrical portion of the machine; Fig. 2 shows a longitudinal section through the poles projecting from end portions; Fig. 3 is a cross-section through the poles, and Fig. 4 cross-section through brush-holder and commutator.

A in Fig. 1 represent the cross-section of the cylindrical portion as noted above, showing the two T-shaped fields. B in Fig. 2 shows the opposite field-pieces carried by the cap ends. C in both drawings represents the cross-section and location of the field-windings, and D represents the bolts which are used in assembling the main portion of the magnetic fields.

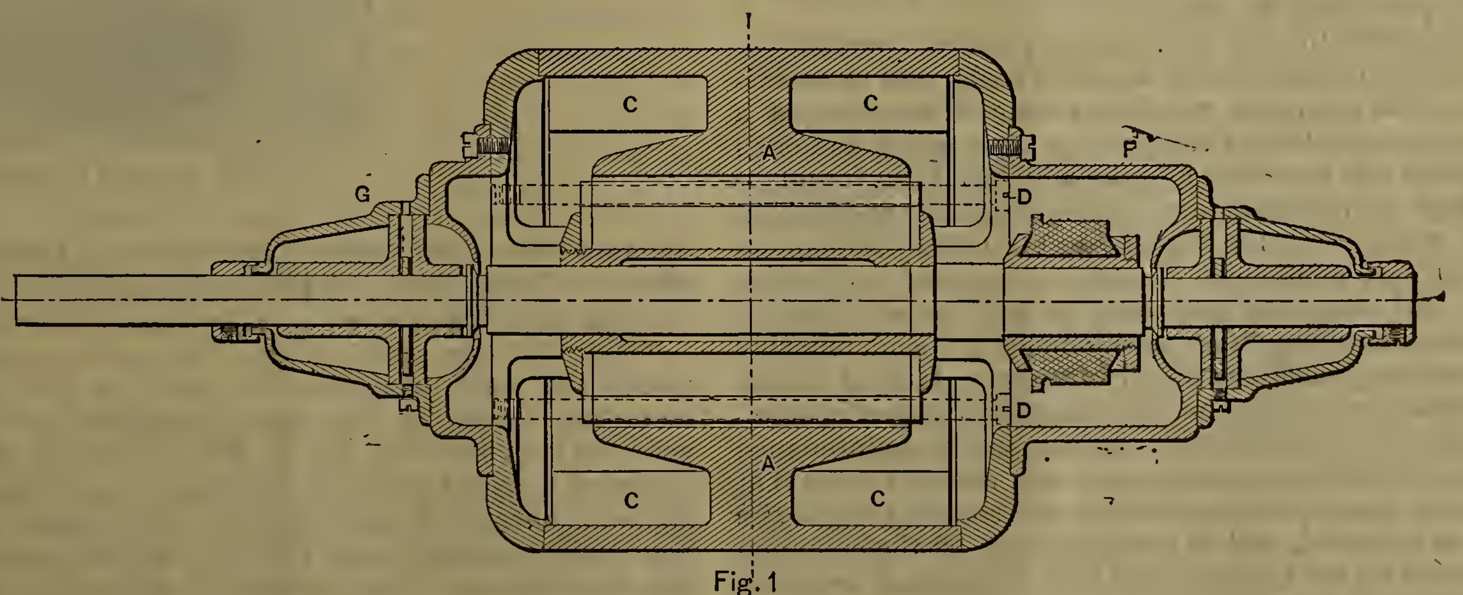


Fig. 1

One of the unique features of this machine is in the construction of the field-magnets. As shown in the illustrations, it is a four-pole machine, and while its machine is of one polarity the ends are of opposite polarity, both ends being of the same polarity. By this it may be readily seen that while this is a four-pole machine it has eight distinct magnetic circuits, making the path of the magnetic circuit uncommonly short and of very low resistance, giving maximum efficiency for minimum quantity of wire. The coils marked C are wound on spools to size, are removable from the spools, thoroughly insulated and slip loosely in the cylindrical chamber, occupying a position in a plane perpendicular to the centre line of the shaft, and are held in position by the pole-pieces A and B.

The armature is of the drum type, toothed. The end caps F G serve for supports and form the outside chambers for the self-oiling bearings. End cap F carries commutator brushes as shown in Fig. 4.

The bearings are of peculiar construction and are of such a design that the motor can be placed in any position as long as the centre line of the shaft is horizontal, the end of caps F being protected by a cap projecting over the opening of the box, thereby rendering the boxes impervious to dust and moisture. In cases where there is much moisture these caps are replaced by stuffing-boxes. This machine is practically a solenoid, and will be known as the solenoid type, and it is at once water, dust and fire proof.

These features will convince all users, present and prospective, as to the enormous range of work to which this machine may be adapted, and that it occupies a position peculiarly its own.

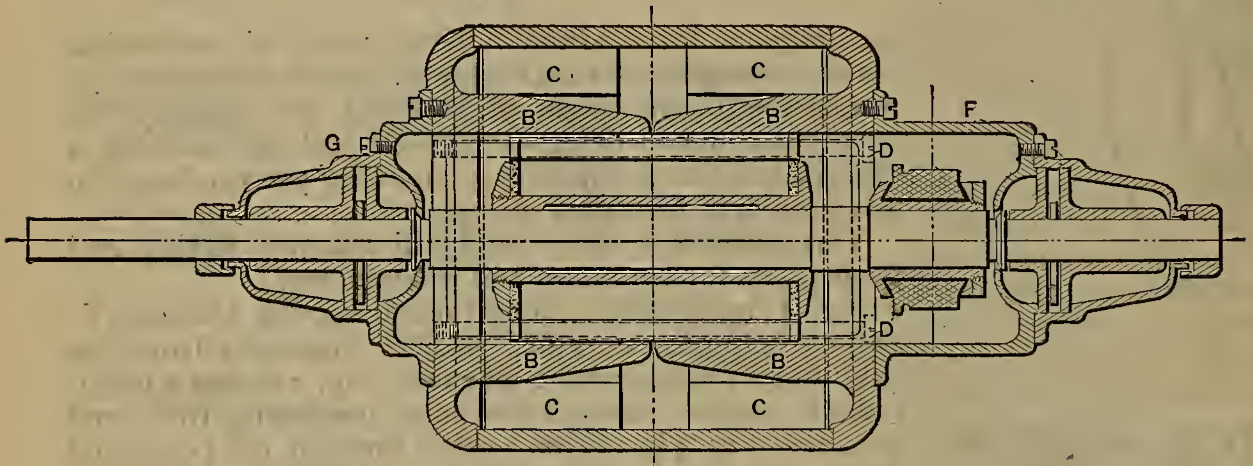


Fig. 2

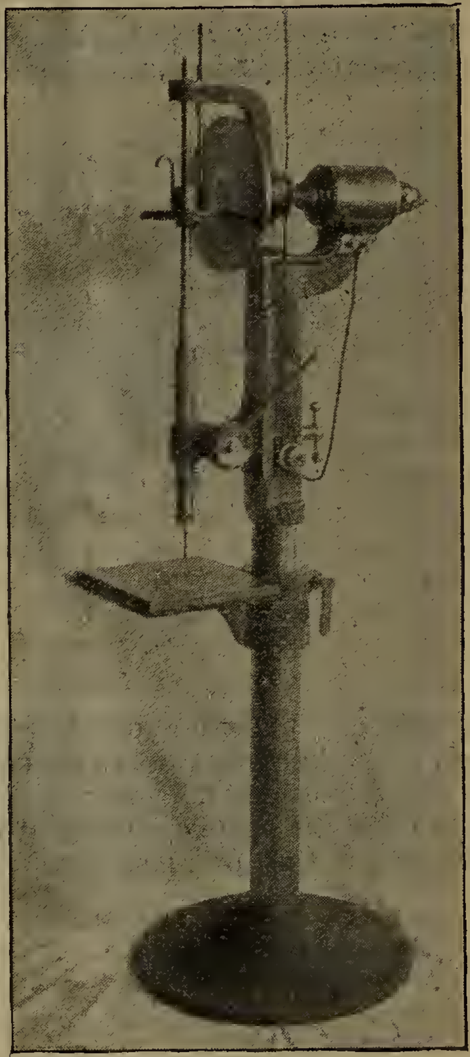
The peculiar form of Mr. Storey's motor permits of its direct combination with machine tools; and as an evidence of this attention is called to the illustration of a 12-inch upright drill of the friction type which has been in practical use for some months and has been found to fully meet all requirements. This particular application of the motor will readily suggest to the mechanical mind the ease with which it could be applied to lathes, planers and other machine tools as well as all types of machinery requiring high and constant speed, notably wood-working machines of all varieties. It is of course unnecessary to enlarge on the many advantages in economy, not only of initial construction, but in maintenance of an electrically equipped plant, as it is well known that a properly constructed generator will simply furnish the power as required, and as tools are shut off the economy goes direct to the coal-bin and is not absorbed by belts, poorly aligned boxes and consequent friction. It would seem, therefore, that a motor having all the advantages claimed for Mr. Storey's invention must find a large and increasing field of usefulness.

The Hornell Iron Works, Hornellsville, N. Y., the manufacturers of these machines, are now in the market with motors adapted to grinding and buffing, the operating of drills and small tools and transmission of small power. The Dahl Electric Co., 120 Liberty st., New York city, is the agent for the manufacturers for the Eastern and Middle States.

A MUNICIPAL ELECTRIC-LIGHT PLANT.

The final report of the electric-light committee of Peabody, Mass., was made on March 7, and the electric-light plant has been turned over to the municipal authorities. The total cost of the plant has been $48,176.92. The building is of brick with granite foundation. The boiler-room contains two 125 H. P. tubular boilers. The piping and valves are of a pattern intended for high pressure and of large capacity for future needs. The engine has a normal capacity of 150 H. P., which is about 50 per cent. larger than is at present necessary.

There are four Edison arc dynamos, having the Schuyler regulators, and each dynamo has a capacity of 48 1,200-candle-power lamps, or the equivalent in incandescent lamps. The town is wired in four circuits, each dynamo being independent and interchangeable on the circuits. There are 149 lamps in use, with 40 miles of wire, lighting 23 miles of streets. The report further states:



STOREY UPRIGHT DRILL.

"We find the average cost for each 1,200-candle-power arc lamp from Oct. 1, 1892, to Feb. 1, 1893, including taxes, is $2\frac{19}{100}$ cents per hour, and for the year the cost per lamp will be $68.72 instead of $75, as reported to you by this committee in our estimate, the lamps to burn from one-half hour after sunset until one hour before sunrise every night in the year except at the full of the moon. The number of hours for each lamp during such a run will be about 3,128. The town has the means and can furnish, with hardly any extra cost, for commercial lighting arc or series incandescent lamps.

"In the cost of running expenses the interest on $50,000 at 4 per cent. is added, and also a depreciation of 5 per cent. on $30,000, taxes on $35,000 at $15 on a thousand, insurance at $195, and every other possible item that can in any way be denominated a part of running expenses."

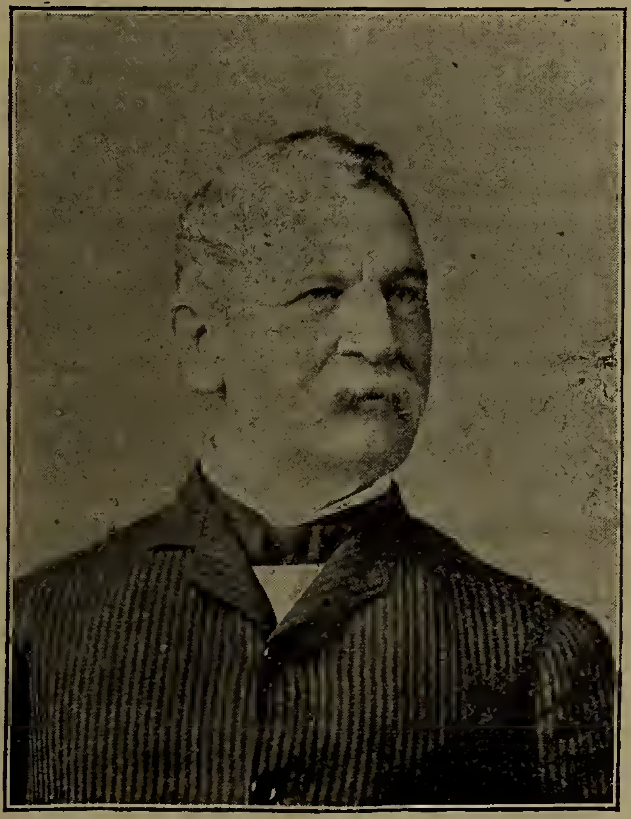
PRESIDENT T. T. ECKERT.

General Thomas T. Eckert, who has for several years been vice-president and general manager of the Western Union Telegraph Company, was elected to the presidency of that company on March 8, to fill the vacancy created by the death of President Dr. Norvin Green.

General Eckert is one of the best-known telegraph men in America and under his administration his company has prospered as it has never done before. He is a man of great executive ability, and is a considerate superior.

He was born in St. Clairsville, Ohio, April 23, 1835, and is consequently very nearly 58 years of age. No one would, however, take him to be so old, as he is a very well-preserved specimen of physical manhood, and he is as active as most men 20 or 30 years younger.

General Eckert learned the art of telegraphy in 1849, and in 1852 he constructed the telegraph line between Pittsburg and Chicago, and has since been ascending the ladder in the telegraph field until now he has reached the top, with many well-earned laurels.



GENERAL T. T. ECKERT.

During the war General Eckert served under General McCellan, in 1862, as superintendent of military telegraphs for the Department of the Potomac with the rank of captain and assistant quartermaster. He was afterwards called to Washington and placed in charge of the military telegraph service, receiving higher military titles. Later on he was appointed assistant secretary of war, which position he held until 1866, when he resigned. He then resumed active participation in the telegraph service, in which he has since constantly remained.

FIRE IN BUFFALO.

The Elk street station of the Brush Electric Light Company, Buffalo, N. Y., was damaged by fire on the evening of February 25 to the extent of $150,000. Out of the 2,600 arc lights which comprise the complete service 1,400 were cut off by the fire. Thirty-six dynamos were ruined, and 8 boilers more or less injured. The dynamo-room was 190 feet long by 90 feet wide. The fire started in the cellar, but how is not known. General Manager C. R. Huntley took immediate steps to secure new apparatus to take the place of the damaged machines, and in the meantime an abandoned station on Wilkeson street has been reopened and will help out on the crippled service until the Elk street station is again put into shape. The street-railway plant will also give some aid.

A FLY-WHEEL BURSTS.

On March 2 one of the three immense fly-wheels in the power station of the Lowell and Suburban Street Railway Company, of Lowell, Mass., burst, causing much damage to the machinery, killing one man and injuring one or two others. The fly-wheel was 20 feet in diameter with a face of 46 inches in width. Assistant Engineer A. H. Meade was the only one near at the time of the accident, and was the unfortunate one in being injured to such an extent that he died within a few minutes after the accident. The cause of the disaster is unknown, but it is supposed that the pulley on the 250 horse-power generator burst, which instantly released the strain of the main belt upon the big fly-wheel and the latter went to pieces. The loss to the machinery is estimated at about $6,000, besides the loss to the buildings.

ANOTHER INCANDESCENT LAMP.

A new incandescent lamp has been on exhibition in Hartford, Conn., the invention of Henry Green, of that place, which, it is reported, is a practical success and at the same time no infringement of the Edison patent. An important feature of this lamp is that the filament may be replaced any number of times at a nominal cost. The lamp can be run 400 hours, affording the standard candle-power during the whole period. The ordinary glass bulb is used and the filament is made by a new process, and, it is said, does not blacken the bulb. A joint stock corporation with a capital of $100,000 will be formed for the purpose of putting this lamp upon the market. Col. W. N. Woodruff, Judge W. F. Henney and Dr. George S. Miller are the promoters of the new company.

The place of business will be located at Hartford, Conn., and the name of the company will be the Green Electric Lamp Company.

NEW BOOKS.

ALTERNATING CURRENTS: An Analytical and Graphical Treatment for Students and Engineers. By Dr. Frederick Bedell and Dr. Albert C. Crehore. New York: The W. J. Johnston Company, Ltd. 325 pages, 112 illustrations. Price, $2.50.

The great and growing importance of alternating currents renders it absolutely necessary that the electrician and engineer should understand the principles upon which this branch of electrical science is based, but up to the present the absence of a connected treatise of the subject has been a very serious handicap.

The present work is the first book that treats the subject in a connected, logical and complete manner. The principles are gradually and logically developed from the elementary experiments upon which they are based and in a manner so clear and simple as to make the book easily read by any one having even a limited knowledge of the mathematics involved. By this method the student becomes familiar with every step of the process of development, and the mysteries usually associated with the theory of alternating currents are found to be rather the result of unsatisfactory treatment than due to any inherent difficulty. The first fourteen chapters contain the analytical development commencing with circuits containing resistance and self-induction only, resistance and capacity only, and proceeding to more complex circuits containing resistance, self-induction and capacity, and resistance and distributed capacity. A feature is the numerical calculations given as illustrations. The remaining chapters are devoted to the graphical consideration of the same subjects, enabling a reader with little mathematical knowledge to follow the authors, with extension to cases that are better treated by the graphical than the analytical method.

The Electric Railway in Theory and Practice. By O. T. Crosby and Dr. Louis Bell. Second edition, enlarged and revised. New York: The W. J. Johnston Company, Ltd., 41 Park row (Times Building). 416 pages, 182 illustrations. Price, $2.50.

In the second edition of Crosby and Bell a great part of chapter 1 has been rewritten, and minor corrections and additions made in the other chapters. Two appendices have been added, "Motors with Bevel Gear and Series-Multiple Control of Motors" and "Method of Measuring Insulation Resistance of Overhead Lines." Eight pages of forms have been added to Appendix D, and the index has been carefully revised and considerably extended by additions from the index notes of a well-known street-railway engineer. This work is the most complete ever published on this important subject, and it is being translated into the French language.

PAPER INSULATION.

At the convention of the National Electric Light Association recently held in St. Louis, Mo., there was an interesting exhibition of paper-insulated wire and cables for electrical purposes. One of the samples of cables shown was of 2,000,000 circular mils and consisted of 260 No. 18 wires stranded and lead covered for electric-lighting service. This cable was made for the United States Illuminating Company, of Washington, D. C., and manufactured on a machine constructed by Cyrus W. Field for the stranding of wires for the Atlantic cable. A prominent feature of this specimen of cable was its massive proportions and yet its flexibility.

Concentric cables for alternating currents was a topic of discussion at the convention. In the exhibit there was shown a cable especially made for this work up to 10,000 volts. It consisted of an inner core of No. 4 B. & S. copper wire covered with paper insulation $\frac{6}{32}$ of an inch; over this was placed a copper ribbon wound spirally, this was covered by a paper insulation $\frac{5}{32}$ of an inch thick; and the whole being covered by a lead covering.

An important feature of these cables is the corrugated lead coverings, the corrugations being made longitudinal so as to allow the cable to be run through a conduit by sliding on only two of them—thus saving labor and liability to abrasion of the lead covering.

This exhibit was under the supervision of Mr. George J. Jackson, 44 Broad street, New York city, who is the general agent for the Norwich Insulated Wire Company. In the telephone and electric-light service, various tests of this paper-insulated wire have been made.

A No. 6 wire with $\frac{5}{32}$ of an inch insulation has shown a resistance of 20,000 megohms per mile in electric-lighting service, and in telephone service a capacity was obtained on a dry core of .067 M. F. and on a saturated core of a .082 M. F. The exhibit consisted of upward of one hundred specimens of lead-covered wires and cables and presented an artistic appearance.

BIDS WANTED.

Proposals are wanted until March 30 for furnishing the city of St. Clair, Mich., with a complete electric-light plant. Mr. Charles Hubel is secretary of the electric-light commission.

Correction.—In the description of the Dahl alternating-current motor on page 153 of our issue of March 11 the compound word "two-phase" was used in four places where "single-phase" was meant. On the second line from the top of the second column "simple *two*-phase alternating system" should have read "simple *single*-phase alternating system;" on the 6th line underneath the illustration and the 15th line under the illustration, the words "two-phase" should read "single-phase" in each case, and on the last line but one in the same column the same change should be made.

NOTES OF GENERAL INTEREST.

The rates on incandescent electric lights for residents have been reduced from $1.15 to 40 cents per month at Fargo, N. D., in consequence of a franchise having been granted to a new company.

The stockholders of the electric-light company, Brigham, Utah, at a recent meeting voted to move the plant to the mouth of the Box Elder cañon, where they will be able to use water-power instead of steam.

The plant of the Lebanon Light, Heat and Power Company, Lebanon, Ind., has been transferred to the Standard Oil Company. After securing $115,000 of the contract it was found that the transfer included the artificial-gas plant, which is not a paying investment, as well as the natural-gas plant.

The fire department wires on certain streets in St. Paul, Minn., are to be placed underground in the Northwestern Telephone Company's conduits.

The Cleveland General Electric Company, Cleveland, Ohio, has recently purchased a large tract of land on Canal street and will erect thereon a large modern power-house. This company represents the Consolidated Cleveland Electric Light and Brush Electric Light and Power companies. The new station will have machinery of 10,000 H. P., and it is expected that the plant will cost from $500,000 to $600,000.

Improved.—*Practical Electricity*, of Boston, appears in a new form in its February 18 number. It is evident that the new management means business. They have an eye to improvement.

CHICAGO NOTES.

Mr. George Cutter, of Chicago, has issued his catalogue for 1893 of "Cutter's Specialties." It is neatly gotten up.

The Chicago Incandescent Wiring Co., 115 Franklin street, expects to change its name and do a general electrical-supply business, and desires to establish agencies throughout the country.

"General" J. W. Godfrey and F. H. Harrington, of the New York Insulated Wire Co., were in Chicago this week homeward bound from St. Louis. They declare that the West is in love with Grimshaw wire and will have it, and it is needless to say "General" Godfrey makes it his business to see that they get it.

The Mosher Electric Co., of 125 Ontario street, this city, made a favorable impression at the St. Louis convention. Its exhibit of arc lamps for direct and alternating current was at the Western Electrical Supply Co., 619 Locust street, and in the hall of the Electric Club were direct-current lamps. Its literature was found everywhere, and its representatives did some "tall hustling."

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Blissfield, Mich.—It is possible that an electric-light plant will be installed in the near future.

Caldwell, O.—It has been decided to light the streets of this town by electricity.

Carrollton, Ind.—It is probable that this town will be lighted by electricity in the near future.

Charlevoix, Mich.—The city authorities have decided to install an electric plant to supply this place with light and power.

Columbus, O.—A committee has been appointed to investigate the matter of establishing an electric-light plant to light the State institutions.

Fargo, N. D.—The city council is unanimously in favor of granting a franchise for an electric-light plant for this city.

Hopkinton, Mass.—The residents of this town are anxious to have the streets lighted by electricity.

Lancaster, N. H.—A company has been formed which proposes to construct an electric plant to furnish light and power to this place, Whitefield, Littleton and St. Johnsbury, Vt.

Manchester, Conn.—The Manchester Light and Power Company will construct and operate an electric plant in this place.

Marblehead, Mass.—The question of lighting this town by electricity is being discussed.

Newark, O.—A resolution has been passed by the council to instruct the clerk to advertise for bids on the construction of an electric-light plant.

Saginaw, Mich.—The Saginaw Power Company has been incorporated to erect a plant and furnish power to the Union Street Railway Company and for other purposes.

Smyrna, Del.—The residents of this place are in favor of having an electric-light plant established.

Warrensburg, N. Y.—It is expected that this town will soon have electric lights.

NEW CORPORATIONS.

Ashland, Wis.—The Electric Power and Storage Company. Capital, $100,000. Officers: Edwin Ellis, president C. F. Latimer, vice-president; L. B. Rowley, general manager, and C. H. Ziehlsdorff, treasurer.

Bangor, Me.—The Eastern Lighting and Heating Company. Capital, $50,000. Officers: President, D. M. Yoemans, Portland; treasurer, Henry McLaughlin, Bangor.

Beddington, Me.—A petition has been made for the incorporation of the Beddington Electric Light and Power Company.

Catasauqua, Pa.—Catasauqua Electric Light and Power Company. Capital, $60,000. Directors: James Thomas, George Davies, Rowland D. Thomas, Roeland F. Davies and Charles Horn.

Chicago, Ill.—The Electric Purchasing and Investment Association. Capital, $10,000. Incorporators: W. D. Gregory, Charles E. Randall and E. M. Stannard.

The Elwell Parker Electric Construction Company. Capital, $500,000. Incorporators: Frederick C. Phillips, Robert L. Tatham and Charles R. Webster.

Concord, N. H.—A petition has been made for the incorporation of the Mascot Water and Electric Supply Company.

The Consolidated Heat, Light and Power Company has petitioned for incorporation.

Grand Rapids, Mich.—Articles of association have been filed by the Peninsular Light, Power and Heat Company. Capital, $20,000.

Hartford, Conn.—The East Hartford Light and Power Company has petitioned for incorporation.

The Mather Electric Company has applied for incorporation.

The Eddy Electric Manufacturing Company has made application for incorporation.

Hillsborough, N. H.—A petition has been made for incorporation by the Hillsborough Electric Light, Heat and Power Company.

Hot Springs, S. D.—The Water, Light and Power Company has been organized by Fred T. Evans and associates. Capital, $1,000,000.

Jersey Shore, Pa.—The Jersey Shore Electric Light, Heat and Power Company. Capital, $5,000. Directors: A. G. Palmer, R. H. Lawshe, P. D. Bricker, Robert McCullough, John S. Tomb, J. T. Childs, D. A. Bingman.

Kennett Square, Pa.—Kennett Electric Light Heat and Power Company. Capital, $20,000. Directors: W. W. Gawthrop, J. M. Palmer, H. H. Gawthrop, D. W. Hutchinson, J. E. Worrell, Henry C. White, John C. Yeatmann and Theodore Pennock.

Litchfield, Conn.—A petition has been made for the incorporation of the Litchfield Electric Light and Power Company.

Manchester, Conn. — The Manchester Light and Power Company has been incorporated.

Meadville, Pa.—The Meadville Electric Light Company. Capital, $30,000.

Milwaukee, Wis.—Northwestern Electrical Association. No capital. Incorporators: C. C. Page, Carroll Collins and T. A. Pamperin. Object: the advancement of electrical industries.

Perry, N. Y.—The Perry Electric Light Company. Capital, $25,000. Directors: Henry N. Page, William D. Page, M. H. Olin, George K. Page and Clarence M. Smith.

Peterboro, N. H.—The Peterboro Electric Light and Heat Company has petitioned for incorporation.

Saginaw, Mich.—The Saginaw Power Company. Capital, $50,000.

Tonawanda, N. Y.—The Electric City Manufacturing Company. Directors: G. A. Spang, James Armitage, A. P. Austin, J. O. Ball, J. S. Tompkins, Albert Spillman and E. G. Riesterer.

BUFFALO NOTES.

The new machine-works of the Snow Steam Pump Works, of Buffalo, which is the largest and most completely equipped machine-shop in the State, will be fitted with electric cranes, motors and lights. Mr. Treckenburg, manager, states that the shop will be in running order about May 1.

Messrs. G. Elias & Bros., lumber merchants of Buffalo, will install a complete electric plant in the new planing-mill which they propose to erect on Perry street.

The new building of the Buffalo Cold Storage Company on Michigan street will have an electric-light plant. W. W. Carlin, 52 Court street, is the architect.

The American Bell Telephone Company, of Buffalo and vicinity, is about to establish an exchange at Depew, N. Y., and is also negotiating for exchanges in a number of small towns in this vicinity.

Mr. P. K. Stearn, of Stearn Bros., consulting and constructing engineers, of Buffalo, N. Y., has accepted the position as professor of electricity at the Buffalo College of Commerce.

J. B. McC.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, March 11, 1893.

The American Electric Elevator Co. has removed to the General Electric Company's building, No. 44 Broad street.

The Mason Electric Co., 10 and 12 Vandewater street, has just issued a catalogue of Mason's new battery system of electric lighting and power. These batteries have been greatly improved by Mr. J. H. Mason, and are claimed to be the best yet produced for the class of work above mentioned.

At a meeting of stockholders of the Edison General Electric Co., held in the Edison Building on March 9, the following-named gentlemen were elected trustees: C. A. Coffin, Thomas A. Edison, Charles H. Coster, S. D. Greene, J. Hobart Herrick, Edw. H. Johnson, Arnold Marcus, Carl Schurz, F. S. Smithers, Samuel Spencer and J. H. Wright.

An interesting circumstance speaks well for the insulation of the Simplex T. Z. R. overhead line wire. The Malden Electric Company, of Malden, Mass., has been for some time using the Thomson-Houston alternating current, and also has several miles of this wire strung about the vicinity. One day an inspector noticed that in one place the wire was apparently lying loose in the crotch of a tree, and instructed a lineman to put up an insulator. It was found that the wire had become imbedded in the fibre of the tree. The growth showed that the wire had been there for two or three years. During all this time the alternating current had been in operation, and the insulation was not damaged.

W. T. H.

ST. LOUIS NOTES.

The Laclede Car Company is very busy filling orders for several electric and cable roads throughout the country. Mr. A. Cook, secretary of this company, was married on March 7 to Miss R. Epstein.

The St. Louis Car Company has a large number of finished cars, some for the St. Louis Suburban Railway and others for Brooklyn, N. Y. Mr. Wells, of the General Electric Co., of Boston, has been for some time superintending the work of equipping several of these cars with electrical appliances.

Mr. Wagner, of the Wagner Electric Manufacturing Company, has a new alternating motor. It is similar in type to the Westinghouse machine, with solid base. The semicircular top-piece is jointed about the centre. There are four poles, and on the end of the armature-shaft is an extra commutator. This company, Mr. F. Schedtmann, manager, also makes direct-current motors and does some repair work for the Missouri Electric Light and Power Company.

The Missouri Electric Light and Power Company uses Westinghouse incandescent alternators and engines. One generator is of 5,000 lamps capacity, and the total capacity of this station is 70,000 lamps, although only 60,000 lamps have been used.

The Consolidated Engineering Company is spoken of in high terms and is composed of a civil, an electrical, a mining and a hydraulic engineer. This company has installed some excellent plants in the West, and is now fitting up a gold mine with the latest improvements in electrical apparatus.

The Elliott Frog and Switch Co., of East St. Louis, is doing a large business in rails, frogs, switches, crossings and other street-railway supplies.

The Brownell Car Company is kept busy with orders for its "accelerator" street car. The double doors and large platform of this car make it of great convenience, especially when large numbers of people are to be accommodated at a time. By means of the double doors ingress and egress are readily accomplished without the vexatious crowding so common with the ordinary form of street car.

Mr. H. H. Wheeler, who is the electrician for the Equitable Building, has met with excellent success during the two years in which he has had supervision of the electrical work in that building, and has added many improvements.

Mr. C. Wolfrom, 9 North Eighth street, is prepared with everything necessary in the electrical line to fit out offices and houses with electrical apparatus and specialties. He has a reputation of being an excellent electrical engineer.

The American Electrical Mfg. Co., maker of incandescent lamps, is idly awaiting for the time when it can resume the manufacture of such lamps. There seems to be a general cry for incandescent lamps, and Mr. Wheeler, electrician of the Equitable Building, says that he will shortly need 1,000. Business has been made stagnant on account of the uncertainty of the lamp situation.

The Emmerson Electric Mfg. Co., maker of the Meeston alternating motors for small fans and power, is kept busy to fill orders. The Dahl Electric Co., 120 Liberty street, New York city, is this company's agent for several eastern states.

The Columbia Lamp Co. is making every preparation to meet the incandescent-lamp suit, which comes up the latter part of this month. Witter & Kenyon, of New York, are the attorneys.

The St. Louis Electric Supply Company, 723 Locust street, is installing the Helios Electric Company's make of alternating arc lamps in the St. Louis Electric Club and the Missouri Electric Light and Power Company's buildings. It also has contracts for the same lamps in Cañon City, Col., Kansas City, Mo., Hot Springs, S. D., and several other western cities.

The Edward T. Cooke Electrical Company, 112 North Ninth street, has purchased the property at 1408 Chestnut street. It will remodel the building and expects to occupy it by May 1. The firm is contractor for all kinds of electrical supplies, speaking tubes, belts, etc. This company fitted up the handsome floral design, five feet in height and four feet wide, for the St. Louis Electrical Exchange. This was illuminated at the recent convention of the National Electric Light Association, and was of the design of the seal of the Exchange.

A. M. Morse & Co., Commercial Building, are general agents for all kinds of machinery, tools, mechanical appliances, etc. W. T. H.

TRADE NOTES.

The Utica Manufacturing and Supply Co., of Utica, N. Y., has just issued a neat catalogue of electric-light and power appliances manufactured by it.

There has just been issued a handsome illustrated catalogue of the Weston Standard station voltmeters, potential indicators and ammeters for direct-current circuits. These instruments are made by the Weston Electrical Instrument Company, of Newark, N. J., and Mr. Chas. D. Shain, 136 Liberty street, New York, is the selling agent.

The Foster Engineering Company, of 21 Prospect street, Newark, N. J., has issued a handsome illustrated catalogue for 1893, of the Foster steam-pressure regulators, pump governors and reducing valves, and other appliances and apparatus manufactured by it.

The North Shore Traction Co, of Lynn, Mass., has placed the contract for its new car-shed with the Berlin Iron Bridge Co., of East Berlin, Conn. The building will be 103 ft. in width and 300 ft. in length, constructed entirely of iron and brick in order to have the station fire-proof. The same company is also making an addition to a car-shed for the Wilmington City Railway Co., at Wilmington, Del.

F. R. Dravo & Co., Pittsburg representatives of the Ball Engine Co., Erie, Pa., have the contract for furnishing the New Horne Building, of Pittsburg, with two 100 H. P. Ball engines.

The Austin Electric Light Co., Austin, Minn., is about to install an 80 H. P. Tandem-Compound Ball engine, built by the Ball Engine Co., Erie, Pa.

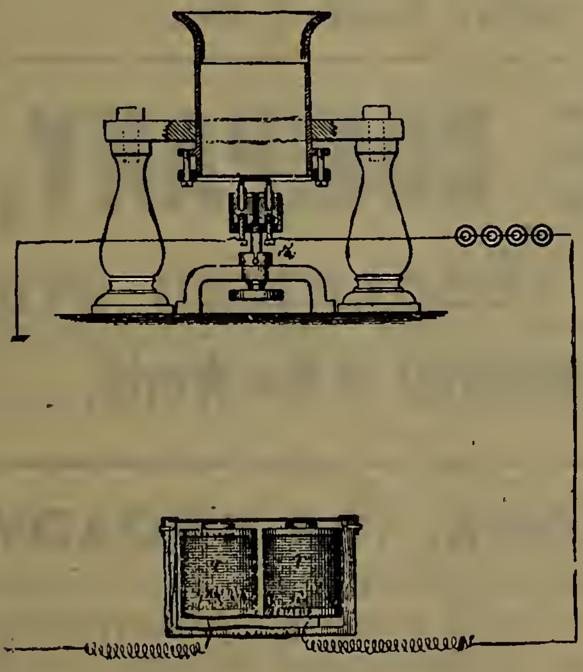
The Electrical Age's Illustrated Record of Patents.

Issued March 7, 1893.

492,773. Electro-Magnet Brake. Andrus D. Ayres, Kalamazoo, Mich. Filed Dec. 21, 1891.

492,786. Automatic Electric Switch. Andrew M. Coyle, Baltimore, Md., assignor to the Standard Screw Elevator Manufacturing Company, same place. Filed Feb. 18, 1892.

492,789. Speaking-Telegraph. Thomas A. Edison, Menlo Park, N. J., assignor to the Western Union Telegraph Company, New York, N. Y. Filed Sept. 5, 1877. Patented in England, Canada, France, Belgium, Austria-Hungary, Italy, Germany, Spain and Russia.



492,789.—SPEAKING-TELEGRAPH.

492,792. Burglar-Alarm. Jacob Ganzfried, New York, N. Y. Filed May 4, 1892.

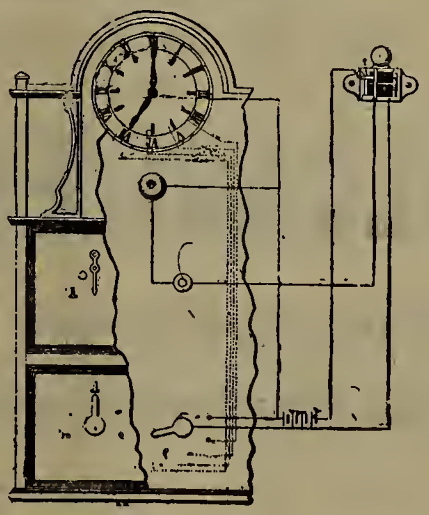
492,807. Automatic Circuit-Breaker. Delos Irish and John G. Williams, Salt Lake City, Utah; said Williams assignor to said Irish. Filed Sept. 14, 1892.

492,809. Incandescent Lamp. John von der Kammer, Chicago, Ill. Filed Jan. 28, 1893.

492,815. Electric-Arc Lamp. Carl K. MacFadden, Chicago, Ill. Filed Aug. 12, 1892.

492,847. Balanced Electric-Drop-Light Hanger. Truman E. Stevens, Blair, assignor of one-half to W. J. C. Putnam Cramer, Omaha, Neb. Filed June 21, 1892.

492,866. Automatic Electric Sprinkler and Alarm. Charles S. Hurd, Cleveland, Ohio. Filed April 13, 1892. Renewed Feb. 8, 1893.



493,067.—HOTEL TIME-ANNUNCIATOR.

492,883. Telephone-Transmitter. Charles T. Bloomer, New York, N. Y. Filed Dec. 14, 1892.

492,888. Dynamo-Electric Machine and Motor. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Oct. 29, 1892.

492,913. Electric Lamp-Lighter. Josephus C. Chambers, Detroit, Mich. Filed Nov. 21, 1892.

492,971. Electric Program-Clock. Andrew J. Reams, Wichita, Kan. Filed Aug. 3, 1891.

493,000. Electric Steering-Gear. Lewis S. Van Duzer,

PATENTS—Continued.

U. S. Navy, assignor of one-half to Newton E. Mason, U. S. Navy. Filed Nov. 26, 1892.

493,007. Secondary-Battery Electrode. Isaac H. Bartholomew, Northford, Conn. Filed May 31, 1892.

493,025. Armature for Electric Motors. Robert H. Hassler, Dayton, Ohio. Filed Aug. 15, 1892.

493,037. Burglar-Alarm. Thomas H. Lovell and George Buckingham, Cleveland, Ohio. Filed July 22, 1892.

493,067. Hotel Time-Annunciator. Franklin S. Carter, Burlington, N. J. Filed Aug. 15, 1892.

493, 04. Dynamo-Electric Machine. William M. Mordey, London, England. Filed April 28, 1891.

493,125. Electric-Railroad Danger Signal and Bell. Paul Seiler, San Francisco, Cal. Filed July 13, 1892.

493,231. Motor-Truck. John A. Brill and Walter S. Adams, Philadelphia, Pa.; said Adams assignor to said Brill. Filed Aug. 2, 1892.

492,837. Apparatus for Automatically Stopping Railway-Trains. Edward W. Robinson, Boston, assignor of one-half to E. B. Welch, Cambridge, Mass. Filed July 13, 1891.

492,881. Leading-Piece for Overhead Electric Railways. Henry D. Winton, Wellesley, Mass., assignor to the Hersey Manufacturing Company, of Portland, Me., and of Boston, Mass. Filed June 20, 1892.

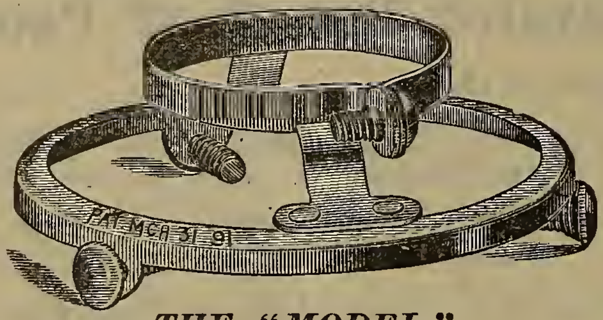
492,882. Street-Car. John O. Adsit, Hornellsville, N. Y., and Charles H. Wickham, Tioga, Pa. Filed May 14, 1892.

492,885. Joint-Box for the Joints of Street-Railways. Elmer O. Evans, Cincinnati, Ohio, assignor to the Johnson Company, Johnstown, Pa. Filed Sept 7, 1889.

492,932. Safety-Guard for Cars. Norman C. Bassett, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Sept. 22, 1890.

493,089. Truck for Electric Locomotives. John C. Henry, New York, N. Y. Filed December 18, 1891.

493,212. Trolley-Wire Support. Frank E. Head, Toledo, Ohio, assignor of one-half to Elmer E. Kuney, same place. Filed June 13, 1892.



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THE DEADLY HOOP-SKIRT.

Great consternation exists in the public mind at the present time over the threatened return to fashion of that peculiar device once worn by women and commonly known as the "hoop-skirt." The public press has of late teemed with prophecies regarding the calamitous consequences of the revival of the hoop-skirt fashion in these days of enlightenment. It is not our present purpose to discourse on the hoop-skirt, crinoline or any other complicated apparatus, but we feel it our duty in this connection to call attention to certain conditions that exist to-day and which did not exist when it was fashionable to encircle the female form with a series of iron rings of varying diameters, held in a horizontal plane and parallel to each other. It has been suggested that the wearing of such a mass of ferruginous material by the ladies in cities where electric-light and trolley wires abound may lead to decidedly unpleasant if not serious consequences to the wearers.

It frequently happens that these high tension currents digress from the straight path laid out for them and invade the substance of near-by metallic and other objects, such as lamp-posts, tin roofs, etc. It has even been alleged that the dash boards of street cars and the rails themselves have received charges of electricity sufficient to cause men and horses to perform acrobatic feats when coming in contact with the charged metal, that they would never think of indulging in during their sane moments.

Now the question that forces itself upon our attention is this : If these things occur when there is no metallic substance present on the person, what will be the result when ladies get to wearing hoop-skirts, all the other conditions remaining unchanged ?

We are not so heartless as to neglect this opportunity to bring this matter to the attention of prospective wearers of crinolines. We have a tender spot in our heart, and we do not wish to see fellow human beings rush headlong into the dangers that lurk in the latest article of fashion. Beware of the deadly hoop-skirt !

CARELESS JOURNALISM.

Carelessness in recording facts in newspapers is frequently attended with injurious results to somebody or somebody's business, and too much care cannot be exercised in verifying reports of any nature, especially if they are of an unfavorable character. This is particularly true in the case of trade journals whose business it is to conserve and build up all legitimate and honest trade and enterprise, and we regret and are surprised that one of our contemporaries should have been so lax in the exercise of this well-established rule in trade journalism as to publish an item in its last issue very unfavorable and injurious to a well-known electrical concern of high standing in this city, when another company with a somewhat similar title was the one that should have been referred to. We do not believe the error was intentional; the writer evidently jumped at conclusions, because there was a great similarity between the names of the two concerns. Such slips do more injury to the innocent victim than a "boycott" of the worst form could accomplish, and when they are made by a paper whose editors ought to know better there is no other excuse that can be offered in extenuation than that of carelessness—pure carelessness.

DAMAGE TO ELECTRICAL WORKS.

Despatches from Schenectady, N. Y., last week stated that extensive inundations there, caused by the formation of an ice-gorge in the Mohawk river, did a great deal of damage to the plant of the General Electric Company. On the morning of March 13 there were two feet of water over the floors of the shops, and communication between the different buildings was accomplished by row-boats. The General Electric Company's exhibit for the World's Fair, which was nearly completed, and part of which was awaiting shipment to Chicago, was badly damaged by the water. The damage to the General Electric Company's property will, it is reported, amount to several thousand dollars.

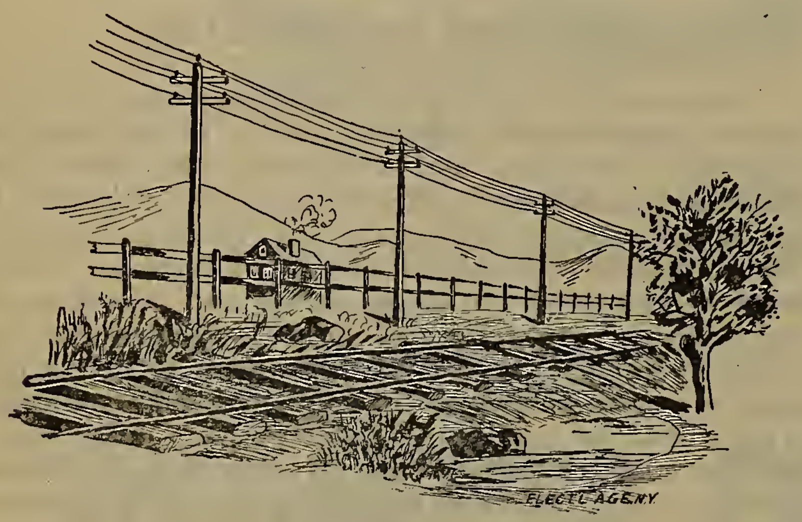
POLES.

BY G. A. NALL.

WHAT part of any overhead electrical plant is the least susceptible of improvement? A little thought will suggest the poles as an answer to this question, and it will be correct, for there is nothing pertaining to an electrical plant that has undergone as little change as the plain, straight and inartistic pole. The function of a pole is to keep the wires it carries elevated above the ground, first to insulate them from the ground, and second to place them beyond the reach of meddlers.

The pole of to-day is practically the same as the first pole, as far as ornamentation is concerned. It is nothing more than a straight stick of timber sticking out of the ground, and save the attempt to make it look a little shapely by tapering it a bit toward the top there is nothing attractive about it. In some cases attempts have been made to ornament poles to better harmonize with the surroundings in some particular locality, notably along Fifth avenue, New York city, where the electric lights are suspended from iron poles of very neat design. Such poles, however, cost too much money for ordinary use.

The fact that poles are necessarily uninteresting objects is probably the reason why there is so little general knowledge concerning them, the source of supply, timber used, etc.

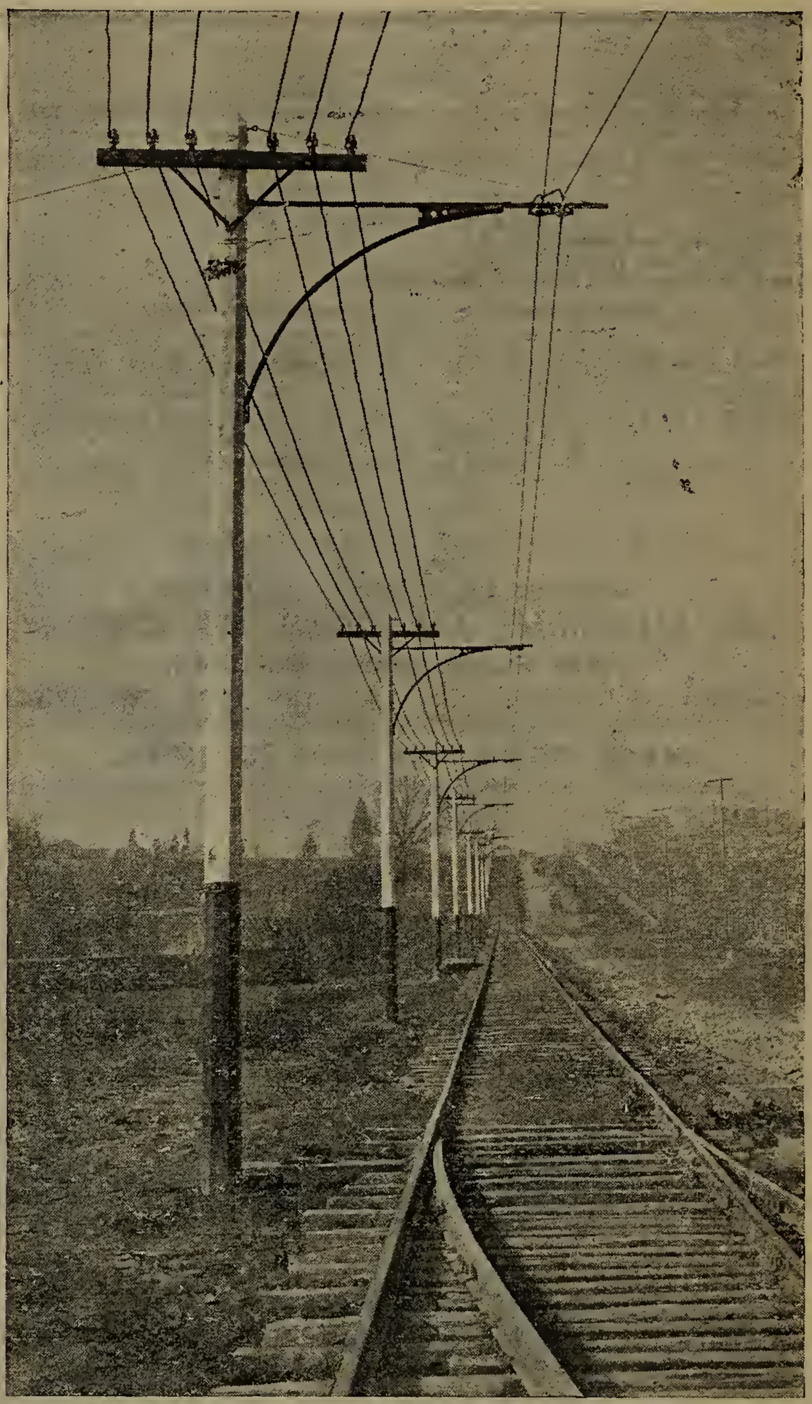


TELEGRAPH LINE ALONG A RAILROAD.

The first use of poles for electrical purposes was for the first overhead telegraph line. If there was any special care bestowed upon their selection or preparation, history fails to inform us. This lapse, however, is immaterial; our object is to consider the poles of the present day.

For many years the telegraph companies were the only users of poles; then came the telephone; next the electric light, and finally the electric railway. Wooden poles are very largely used for all these purposes, although many iron poles are also used for electric railways. Iron railway poles have the advantage of being strong as well as light, owing to the built-up method of their construction. There are very great lateral strains on railway poles. and a wooden pole to resist these strains must be necessarily heavy and large, although wooden railway poles, are preferred in many cases. They are made very carefully and are trimmed and shaped in such a way as to make them as unobjectionable as possible.

Telegraph poles being the first in order, they are entitled to first consideration. The Western Union and Postal Telegraph companies are, of course, the largest users of poles of this kind. Naturally the part of the pole placed in the ground is subject to more rapid decay than the part above ground, and to prevent this as much as possible the butts of the poles are sometimes treated in one way or another. The Western Union Company, however, after long experimentation, has concluded that it does not pay to treat their poles in any way whatever; they are put in the ground without previous preparation. Charring the butt of the pole is probably the best method known to arrest decay; but in the case of a large user of poles, like the Western Union, the process involved so many different handlings that it was abandoned as uneconomical.

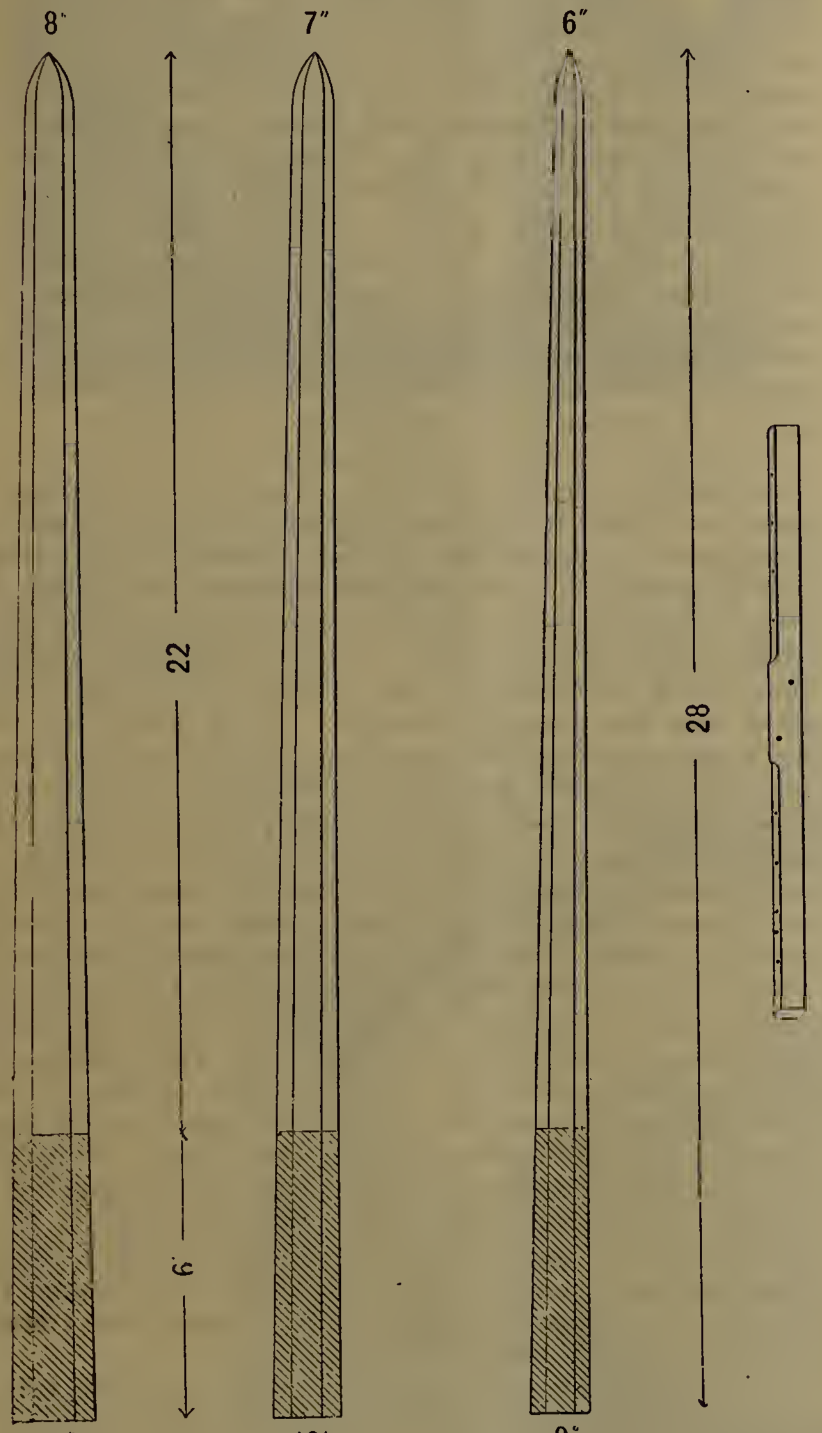


WOODEN ELECTRIC RAILWAY POLES WITH SIDE BRACKETS.

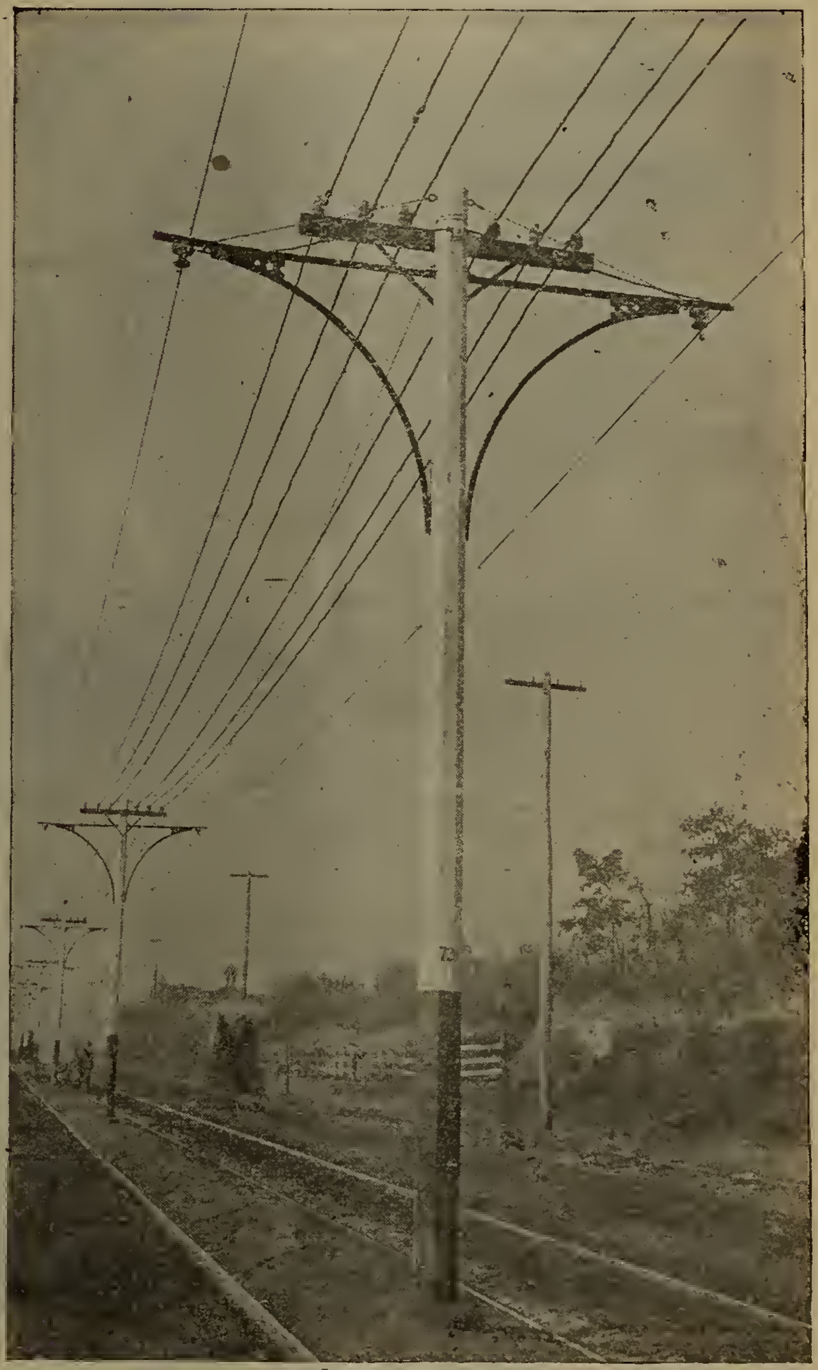
Tarring was also tried, but the effect of the tar was rather detrimental to the timber than otherwise. This action is explained on the supposition that the tar prevents the escape of the sap, and the resulting fermentation was injurious to the wood. There are several other methods of treating poles, and some of them are practised by electric-light and other concerns using poles in comparatively small numbers; but as a rule telegraph poles receive no special treatment before being set.

The source of supply of poles is a question that naturally suggests itself, and that can only be answered by saying that poles come from the country at large. The pole lines of telegraph companies stretch over mountains, through valleys, and along highways and by-ways, and to transport the poles from any particular point to where they are needed would be expensive. Therefore it is the practice to get the timber from a locality as near as possible to where the poles are to be used, and thus save the expense of handling, freight charges, etc.

All kinds of wood are not suited for electric poles. For telegraph purposes chestnut, white cedar, yellow cedar and red cedar timber is found to be the best, and the use of any one kind depends, of course, upon the abundance of it in a particular locality. Chestnut wood is tough and elastic and makes a very durable pole. Such poles will last from 12 to 18 years, according to circumstances. Red cedar is less subject to decay than any of the above-named woods, but it is not so tough as chestnut. Red cedar poles remain in a good state of preservation for more than 25 years.



OCTAGONAL POLES.



WOODEN ELECTRIC RAILWAY CENTRE-POLES.

The Western Union Company uses from 75,000 to 100,000 poles annually, and they cost from $1 to $5 each. Extra large poles, such as are found in large cities, cost $1 a foot, dressed. Probably the finest specimens of telegraph poles ever seen were those which flanked the Western Union headquarters in New York before the pole crusade. There was one on Dey street and one or two on Fulton street. They were brought from Oregon and cost the company $99 each, that is, for the bare pole. They were originally shaped for the masts of a ship, but they were so straight and long that they found a different use.

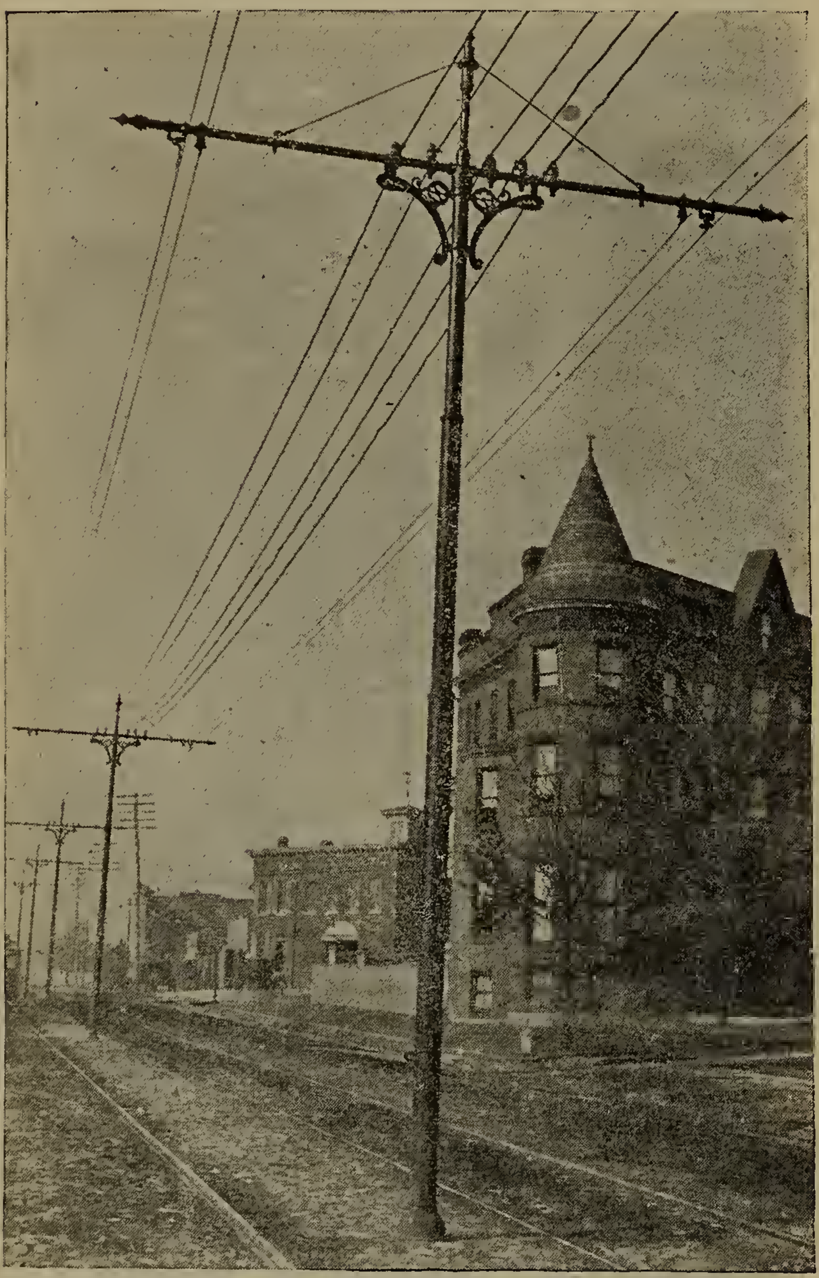
Iron poles are not used at all for telegraph purposes in this country, where wood is plenty. They are, however, used extensively for railway work, and this class of poles will be considered more particularly later on.

No effort is made by the telegraph companies to season their poles. They are used green, just as they are cut down and after being trimmed. A peculiar fact was developed during our investigation regarding the life of poles. Mr. D. Doren, the superintendent of construction of the Western Union Telegraph Company, stated to the writer that, contrary to general opinion, dry earth was more destructive to poles than wet ground, and that white sand shortens the life of a pole from three to five years. Wet ground, however, seems to have a pickling effect on the wood, and poles in such localities last longer.

The life of a pole in cities is about 12 years ; but along country roads the record is not so high, because poles running along highways in the open country are more exposed to the ravages of storms than in cities, where the tall buildings protect them. There is no standard of length for telegraph poles. In cities they average from 35 to 50 feet, and along country roads 25 feet or more. Twenty-five-foot poles are usually set in the ground 4½ to 5 feet, and 30-foot poles from 5 to 5½ feet. The holes are made in the ground by an auger and the application of muscle. On the prairies the holes are dug with a sharp-pointed spade.

Where more than two wires are to be strung on poles cross-arms are used. The smallest number of wires ever run on cross-arms is two and the largest ten. The cross-arms are made of pine, with the upper surface rounded off so as to shed the rain.

The number of poles used per mile depends upon the number of wires they are to carry. In cities they probably average 40 to the mile, and 33 to 40 in the country, according to the condition of the roads, whether they are straight or crooked. In setting poles in the United States allowance has to be made for variations of temperature. For instance, in the northern part of the country, where the variations are great, the poles are set nearer together than is the custom in the southern part, where the range of temperature is much less. This is because the wire expands and contracts with heat and cold, and should the span between poles be too great the wire would at times be too slack or too tight.



IRON RAILWAY CENTRE POLE.

The Long Distance Telephone Company uses poles of the most durable wood, white cedar being preferred. Some of the poles come from Canada, Michigan and Wisconsin, and the standard length is 40 feet.

Taller poles are used in cities, however, and in places where it is necessary to carry the wires higher than usual. The cross-arms are of Norway pine, the standard size being 10 feet long, 4¼ x 3¼, and are finished off, then painted. Each cross-arm is braced with iron braces to keep it in position and level. The insulators used by this company are known as the American Telegraph and Telephone pattern, and differ from the ordinary glass insulators in being a little heavier. About 40 poles are placed to the mile, and each is put 6 feet under ground.

A large lumber concern in Michigan, which makes a specialty of poles for electric railroads, telegraph, telephone, electric-light and other electrical purposes, turns out a very good quality of work. It uses Norway pine and improves the appearance of its poles by making them octagonal in shape.

The factory also uses large quantities of cedar, which, it is said, is by all odds the most durable of northern woods, and may be safely counted on for twenty years' service. Norway pine ranks next. This company covers seven feet of the base of all octagonal poles with creosote and rock oil to preserve the timber, and above that paints the poles of a drab color to within two feet of the top, these two feet being painted red. Large quantities of electric-railway poles of wood are turned out by this concern, the standard length being 28 feet. They are made in three sizes as regards diameter—viz.: 6 inches, 7 inches and 8 inches at the top, and 9, 10 and 11 inches respectively at the butt. The principal advantage of wooden poles over iron for railway purposes is the cost, and when they are well made and painted they are as sightly as the latter. The accompanying illustration gives a good idea of the appearance of these poles.

Iron poles are used very extensively on electric railways and for electric lighting. Those of the former class are subject to extraordinary strains which the common wooden poles could not bear. One style of iron pole is made of four longitudinal segments with flanged edges, similar to the well-known Phœnix column, through which rivets or bolts pass. This construction represents, it is claimed, the least amount of material and labor with the greatest strength. These poles are always open and free for inspection or painting, and can be easily climbed if necessary. Of these poles there are made side poles, "pull-off" poles, centre poles, centre poles for curves, end-poles, single-bracket poles; all of these being used for electric railways. Side-poles are placed on the sides of the street, and these support the trolley suspension or span-wire; pull-off poles are special side-poles of extra length and made especially heavy to stand the strain due to a number of radial lines. They are used on corners to hold back the trolley lines when making a curve. Centre-poles are placed in the centre of the street between tracks, about 125 feet apart, except on curves. On curves the "centre-curve pole" is used. It is like the preceding one, only heavier in construction, to stand the lateral strain. The end centre-pole is the end pole of the trolley line and is also like the centre-pole, but made heavier. And the single-bracket pole is placed on the side of the street for single-track roads when the track is near the curb.

Iron poles are made by another concern on the tube principle. The method of construction will be understood by reference to the illustration, showing this class of poles. Each pole is made up of sections of tubing of different diameters, the second section fitting into the first and the third into the second, after the manner of a marine telescope.

THE BROADWAY CABLE ROAD.

On March 14 the first cable car was run over the up-town section of the Broadway cable line, New York city. This section extends along Broadway from 36th street to 59th street, the power-house being at 51st street. The cable was started at 1 P.M., and President John D. Crimmins, with a party of directors and friends, boarded a car and rode over the line as far as 59th street and back to the starting point. The car was greeted with great cheering.

WESTON STANDARD INSTRUMENTS.

Among the various makes of station voltmeters, potential indicators and ammeters for direct-current circuits, it is safe to say that none are better known than those manufactured by the Weston Electrical Instrument Company, of Newark, N. J., and these instruments are now generally accepted as standard.

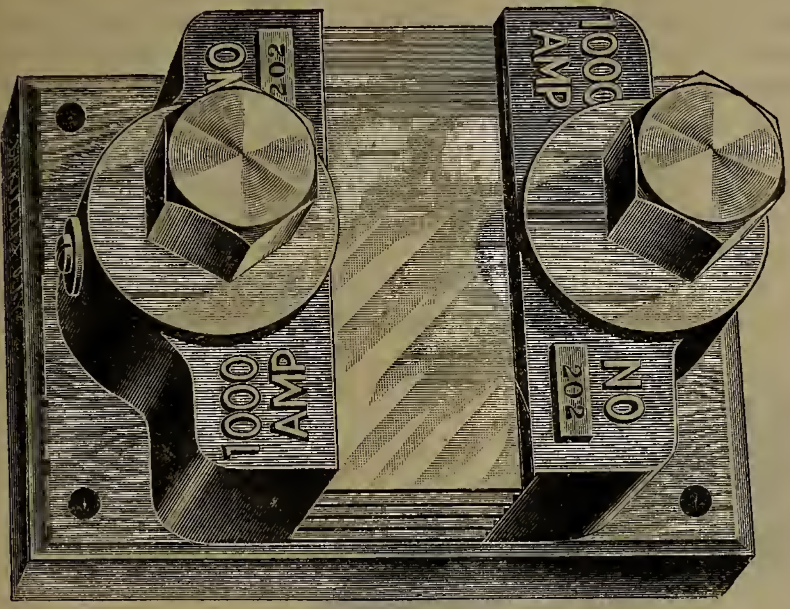


FIG. 2.

A few words regarding the main points of these instruments will be of interest. The principle upon which they are constructed is that of the simple movement of a small coil through a uniform magnetic field against the opposing force of a very light spring. In this construction magnetic lag is entirely eliminated by avoiding the use of moving iron parts. The magnetic field being uniform, the coil to which the pointer is attached necessarily assumes a position corresponding exactly with the amount of current passing through it The instruments operate with a very small amount of energy, and they are entirely free from heat errors, even

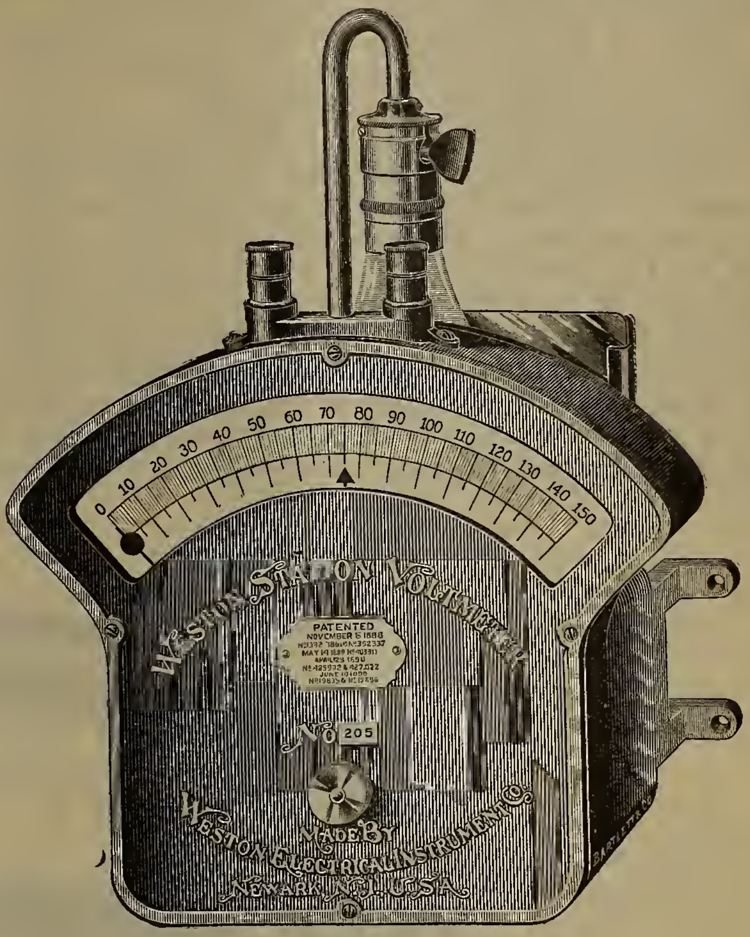


FIG. 1.

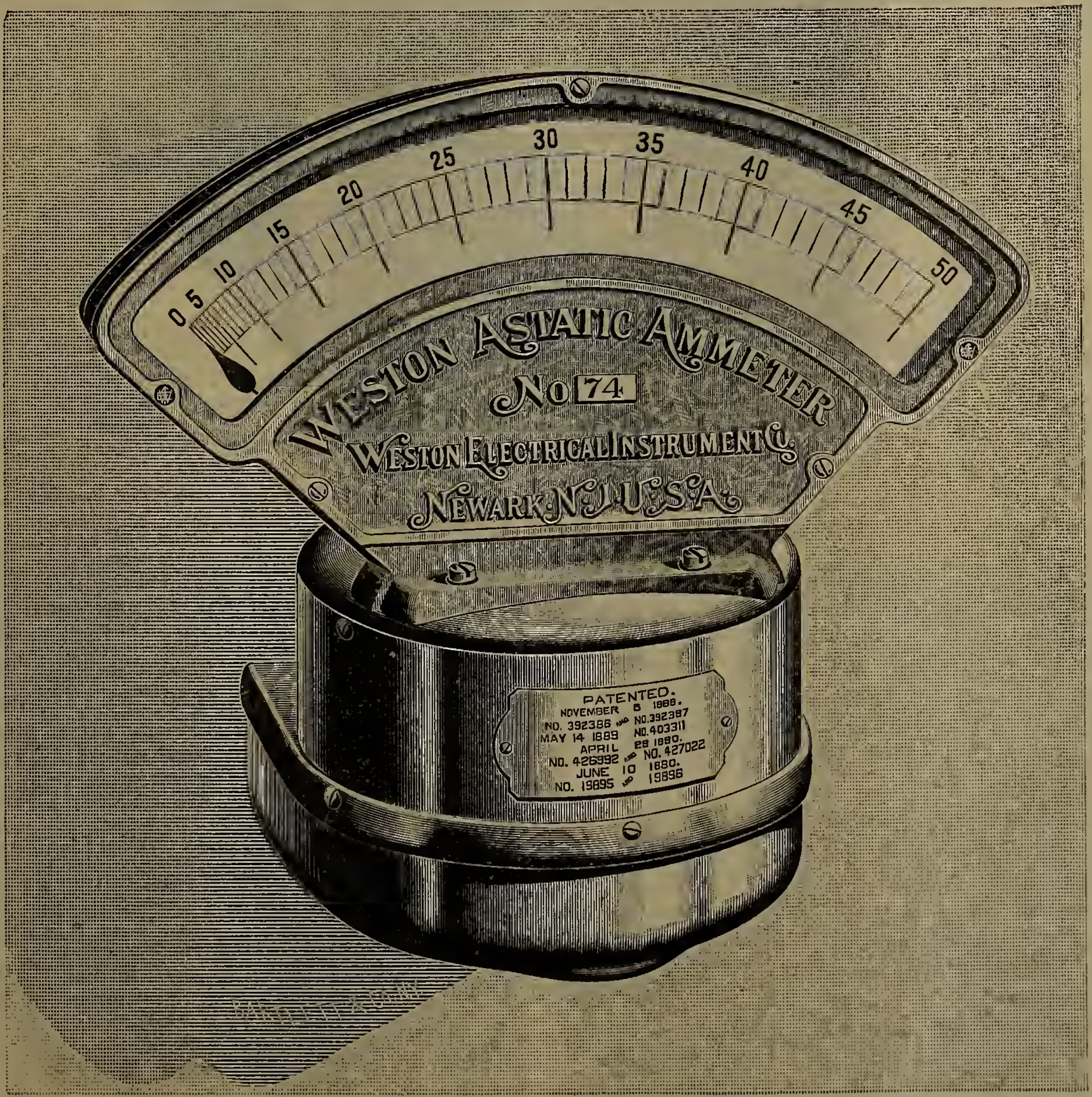


FIG. 3.

when allowed to remain in circuit continuously. They are extremely "dead beat" and their scales are absolutely proportional throughout their entire range.

With this general description of the instruments in principle and construction, we shall now consider specifically the instruments illustrated herewith.

The standard illuminated dial-station voltmeter (Fig. 1) depends for its operation upon the fall of potential between two points of the circuit carrying the main current, and requires a difference of only about .03 volts to give the full scale deflection, at which time it is taking only .07 of an ampère, no matter what the total capacity of the instrument may be. The shunt required to secure the necessary fall of potential is separate from the case, and is designed to be placed at the back of the switchboard. Only very thin wires are necessary to carry the very small current required to operate the instrument, No. 12 or No. 16 B. & S. gauge being sufficient in most cases. A 5,000 or 10,000 ampère instrument of this type requires nothing more to connect it in circuit than this thin wire, which is furnished with each instrument. The case is of cast iron, of neat design, dust-proof, and a thorough protection to the working parts from mechanical injury. It is also an effective shield against disturbing influences of external magnetic fields.

These instruments are very economical of power, the energy required to operate them on a 100-volt circuit not exceeding .03 of one per cent. of the total energy delivered to the circuit, and this is true of all the ranges and at all loads. They are practically free from friction error, and are extremely sensitive and accurate. Some idea of their sensitiveness may be had from the fact that the turning on or off of a single lamp can be noticed on an instrument of 1,200 ampères capacity. If at any time a station capacity should be increased, the ammeter can be recalibrated, since by its construction it can be adjusted to any range. The scales are made of opal glass, at the back of which is placed an incandescent lamp and a pair of mirrors to illuminate the scale effectively and uniformly from behind, thus rendering the lines of the pointer distinctly visible at a long distance from the instrument.

The station ammeter shunt shown in Fig. 2 is made in two styles, one of copper and the other of one or more sheets of a special alloy. The copper style, however, is somewhat more accurate than the other, but is also much larger. With the copper shunt the ammeter is practically independent of changes in temperature, remaining correct in its indications at all temperatures. In the special alloy shunts a small error is introduced by changes in temperature. This, however, is easily corrected.

Fig. 3 is an illustration of a central station and isolated-plant astatic ammeter. This instrument is of the electro-magnet type, and has been expressly designed to meet the demand for a good moderate-priced dead-beat and reliable ammeter. These instruments may be used in the presence of most intense magnetic fields without affecting the readings. They are encased in metal throughout and the operative parts cannot be displaced. The bearings are sapphire and the instrument is dust-proof. These instruments are well made and carefully standardized.

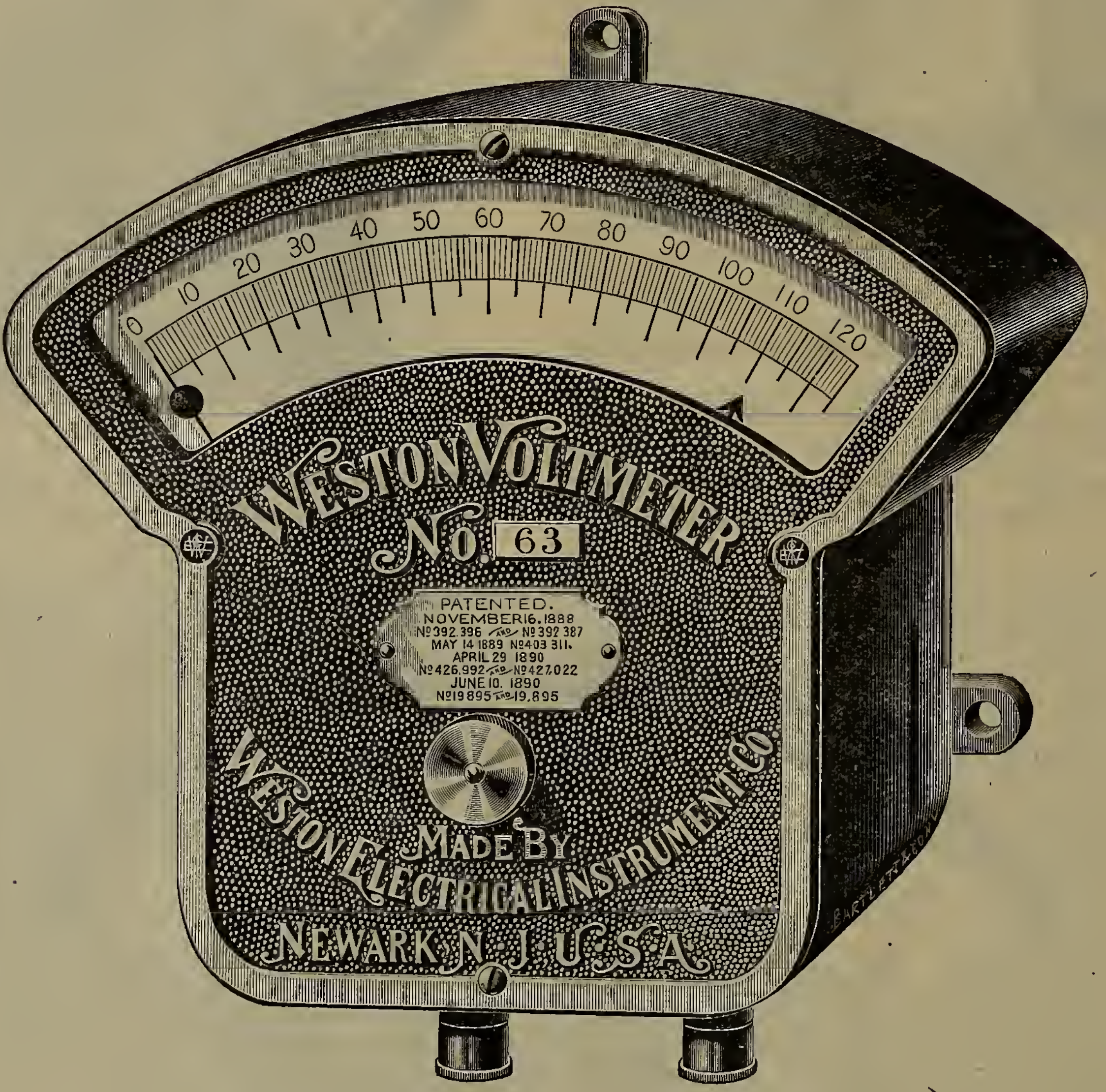


FIG. 4.

An isolated-plant voltmeter is shown in Fig. 4. These instruments are in every way equal to the Weston portable standard voltmeter and illuminated dial-station voltmeter. They are expressly designed for switchboard use in isolated plants and small stations, and are in every way adapted for this class of work. They are thoroughly reliable and placed in an iron case, which affords effectual protection against external magnetic influences.

Mr. Charles D. Shain, 136 Liberty street, New York city, is selling agent for this company.

THE MOST ECONOMICAL AGE OF INCANDESCENT LAMPS.*

BY CARL HERING.

(*Continued from page* 151.)

To show the effect of the price of the lamp and the price of the power, the curves in Figure 2 have been drawn. Curve *e* is, as before, that for the average lamp costing 45 cents, while the power costs 15 cents per kilowatt hour. In curves *g* and *h* the cost of the lamp was taken at 55 and 35 cents respectively. They show that the minimum point is reached only about 50 hours later when the lamp is 10 cents dearer, and only about 50 hours earlier when it is 10 cents cheaper. The minimum cost is about 2½ per cent. more in the first case, and 2½ per cent. less in the second. The cost of the lamp therefore makes comparatively little difference in the best age of the lamp; it affects the cost considerably more at 400 hours than at 1,200 hours where it is practically insignificant.

If for the same price of the lamp, namely 45 cents, the cost of the power is taken at 20 and 10 cents, the resulting curves will be *i* and *k* respectively. This shows that the minimum point is about 100 hours earlier in the first case and 100 hours later in the second. This point is furthermore more decided when the power is more expensive (see curve *i*), showing that for expensive power it is very much more important to replace lamps earlier, while for cheaper power it will make less difference. For cheap power with cheap lamps the position of the minimum point with respect to time will be altered very little from that of the mean curve *e*; this is also true for expensive lamps with expensive power. The five curves show the following: That even for considerable ranges the best age remains at between 300 and 500 hours; that the effect of the cost of power is much more important than that of the price of the lamps; that the latter is not of so much importance as is generally believed. All the curves show that while there is a minimum point it is not very definitely located as to time—that is, it makes but very little difference if the lamps are replaced at 300, 400 or 500 hours, but after that the difference becomes apparent.

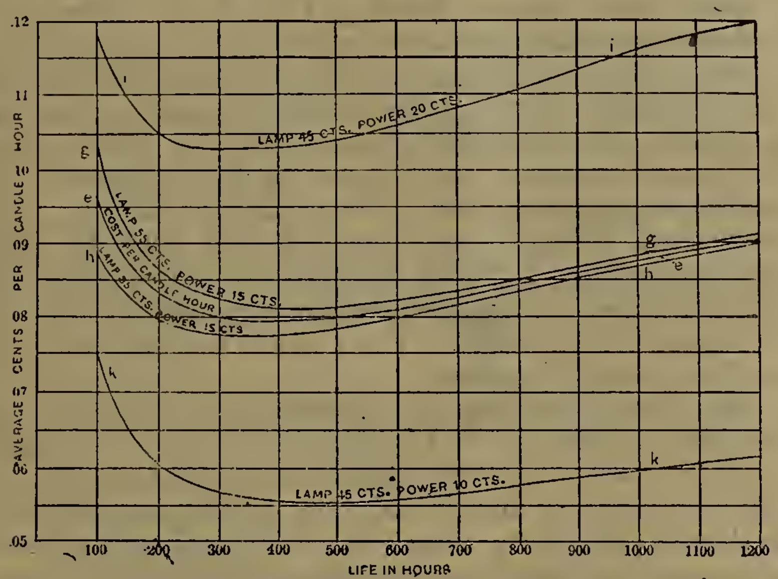


FIG. 2.

So far we have been considering the average of all the lamps in Professor Thomas' paper. In order to show the relative differences as well as the absolute values for the different lamps the curves in Fig. 3 have been drawn for seven of the most important of the thirteen lamps; they refer, though not in order, to the Thomson-Houston, Packard, Edison, Beacon, Perkins and Pennsylvania lamps. The letters of reference are the same as those in Professor Thomas' paper. He selected these seven as the most important and gave me the price of each lamp. These prices were divided in each case by the initial candle-power of each make, as given in that paper, to obtain the cost prices per candle. These candle-powers were as follows: A = 16.0, B = 13.1, F = 14.2, G = 17.1, K = 17.0, L = 13.2, M = 12.5.

A comparison of these curves with those in Professor Thomas' paper will show the effects of certain features. Such a comparison would be far more interesting and instructive were we allowed to know the names of each one of the lamps.* We can merely say here that *B* and *G* are evidently poor lamps, while *M*, *F* and *A* are the best, notwithstanding that one of the *M's* died very early, which is equivalent to increasing the price of the other nine lamps. *K* would have been among the best had not one lamp broken at the critical point. The best age of all but *M* are between 300 and 400 hours.

The scale of ordinates in Fig. 3 is much larger than that in Fig. 2 and the minimum point is therefore much more marked. The offsets in curve *K* and *L* are due to breakages among the 10 lamps of which these results are the mean. Curve *M* is dotted merely to distinguish it from those which it crosses at a number of places.

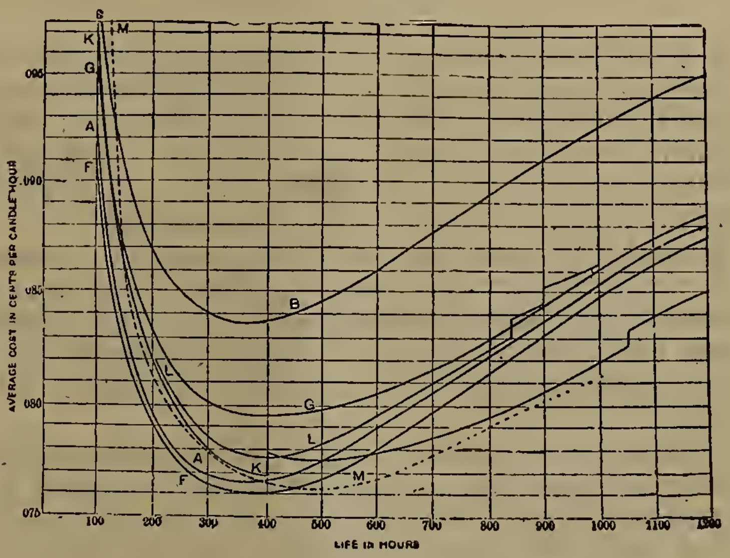


FIG. 3.

Whatever other deductions may be made from this investigation, the most important is that lamps might to advantage be forced much higher than is customary, at the expense of their life. This, though it requires more frequent renewals, will be a gain to the consumer as well as to the central stations; the former will get better and cheaper light, while the latter will be able to increase their output in lights or run the same number of lights at less loss in the mains, or what is equivalent, run the same number of lamps on considerably smaller mains. How far the lamps may be forced before the other extreme is reached, is a question to be determined when we have the data for such new lamps.

In conclusion I desire to state that while some of the results obtained from the present investigation are somewhat striking, it must not be forgotten that we have been considering the cost of *a candle-power of light;* as it is far more difficult to notice slight differences in the light than it is to notice the bills for lamp renewals, it would not be wise to adhere too strictly to what theory tells us. In practice, therefore, lamps need not be renewed as early as these deductions point out; at the same time, however, the results clearly show that it is absurd to keep lamps running too long, and that the life of our present lamps is more than sufficiently good. Perhaps the best practical rule for renewing lamps is to run them until the diminution in candle-power becomes noticeable; after that point is reached we may rest assured that it is economical to throw them away. It might be argued that the original data is of too crude a form to admit of making deductions involving small differences. The differences, however, are not slight but very apparent, and I presume much greater than any possible inaccuracies in the original measurements. Furthermore, they show the existence of a uniform law. This paper should be considered more as an investigation of the subject and not as one claiming to show that present practice is radically wrong. I merely wished to prove conclusively the well-known fact that it is absurd to run lamps too long. By far the most important conclusion is, that it would be far better to force lamps at the expense of their life than to run them at the present efficiency.

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* Paper read at the seventy-fourth meeting of the American Institute of Electrical Engineers, New York, February 21, 1893.

* Just before going to press I have received permission from the makers to state that the lamp marked M is the "Pennsylvania" lamp.

WILL THE CLOSED CONDUIT SUPERSEDE THE TROLLEY IN LARGE CITIES?*

BY FRANK C. PERKINS.

It would be folly for any one to assert that the trolley system for operating electric railways will be thrown out of use in small cities, villages and rural districts; and until some efficient, practical and reliable closed-conduit system is brought before the public, the trolley will still continue to be used in the large cities as well.

A conduit system, however simple, could not compete with the trolley in the country, where long lines are necessary, and where wooden poles and a comparatively cheap line construction give good satisfaction to the railway company, and is not seriously objected to by the public.

In large cities, however, where the trolley system is so greatly objected to, on account of the so-called "unsightly overhead wires," the conduit system, when perfected, will find many advocates, and will be readily adopted by street-railway companies interested. After looking at a street crossing in Boston, with its network of wires as used in the trolley system, and then noticing the entire absence of overhead conductors in the city of of Buda Pesth, Hungary, one is impressed with the advantages of the conduit system as well as the great difficulties under which our firemen have to work. Regarding the cost of construction, a conduit system would compare very favorably with the trolley in cities where the authorities insist on the feeder-wires being placed in underground conduits and where an expensive line construction, with iron poles, guard-wires, etc., is required.

The systems now in use for operating electric railways are, 1st, the trolley, and 2d, the open-slot conduit. Every one is so familiar with the trolley system that to go into details regarding its operation would be a waste of time; but we are not so familiar with the open-slot conduit as it is not in general use at present.

The Siemens and Halske system has been in use for some time in Buda Pesth, Hungary. The Love system is now in operation in Chicago, and the Bentley-Knight system was operated a short time in Boston, but has not been in use for several years. The greatest difficulty the companies using the open-slot conduits have to contend with is maintaining a good insulation for the main conductors, the loss of current through leakage in wet weather being sometimes very great. Many methods have been proposed whereby closed conduits might be used, thus avoiding the misuse of the conduit for a sewer, as is often the case with open conduits.

The closed-conduit system is the one we wish to discuss this evening. Many patents have been granted in this line of work, and it will be interesting to study some of them.

The conduits may be divided into two groups. 1st, those operated electrically, such as the Lineff, Smith, Harding, Heron, Dewey and others. 2d, those operated mechanically, such as those of Vandepoele, Thomson, Brain and others.

The objects of the closed conduit are to do away with slotted channels and to shut in the conductor so that neither dirt nor water can reach it and form a source of leakage.

An English patent was granted to Alexander Lineff, of London, July 11, 1888. The characteristic feature of his invention is that a magnet on the car, as it travels, keeps attracting or drawing up fresh portions of an iron band, and thus puts the conductor proper in electrical connection with one or two sections of an upper rail, from which the current can be collected by a trolley wheel, in the usual manner, for driving the car. In case the connection is broken, a battery must be kept on the car to energize the magnet, in order to again pick up the iron band or conductor within the conduit.

Mr. H. W. Smith, of Newark, N. J., was granted United States patents March 5, 1889, for a system using a closed sectional conduit, in which the connection was made from the main bare conductor, inside the conduit, to the surface sections by means of small armatures mounted on bearings within the conduit. These armatures were attracted and drawn up by permanent and electro magnets mounted on the frame of the car. The permanent magnets were undoubtedly used to avoid carrying storage batteries on the car, in case the connections were broken between the main conductor and the sections of the conduit. The current is conveyed to the car by means of brushes.

Mr. Chas. Harding, of Atlantic, Iowa, was granted English patents April 15, 1891, for a sectional closed-conduit system, in which each section of the conduit was connected to the main conductor within, automatically as the car passed, by means of electro-magnetic switches or contact devices placed in sealed boxes, one for each section.

Mr. Wm. B. Heron, of Brooklyn, was granted American patents August 18, 1891. His plan is to use a magnet on the car, and a "travelling armature" on wheels within the sectional conduit. As the car moves along, the travelling armature is attracted or drawn along by the magnet on the car. It is not stated how the travelling armature is picked up again, should it wander away from the car.

An American patent was issued to Mr. Mark W. Dewey recently, on an induction system, using alternating currents, the arrangement of the transformers being such that the primary circuit is underneath the roadbed, while the secondary is carried upon the car, so that there is no metallic connection between the car and the main circuit from which the current is derived.

Mr. Dewey's plan is to place the primary coils wound upon U-shaped iron cores in the roadbed between the rails, at equal distances apart and at intervals corresponding to the length of the car. The apparatus carried on the car constitutes the other half of the transformer. Each motor has an inverted U-shaped or straight iron core, upon which one or more secondary coils are wound. When a good alternating-current motor is placed on the market, this system will undoubtedly receive greater attention than it has heretofore.

The late C. J. Vandepoele invented a system which works mechanically and is in reality an open-slot conduit with a rubber or other flexible guard, which is pressed open as the plow moves along and closes the conduit after the car has passed.

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* Paper read before the Buffalo Electrical Society, March 6, 1893.

Mr. Elihu Thomson invented a similar closed conduit, using a brush or broom as a guard, instead of rubber, to close the slot.

February 7, 1893, the writer was granted a United States patent for a closed-conduit system for electric railways, consisting of a bare conductor mounted on an insulating support in a conduit, the top of which is rendered elastic by being formed of sheet-metal adapted to be pressed into contact with the supply conductor by a motor-car.*

It may be well to consider the surface leakage from sectional-conduit systems operating say 50 cars. The only data obtainable at present are from experiments made by Mr. Gisbert Kapp, author of "Electrical Transmission of Energy." In a paper read by him before the British Association September, 1890, in reference to the loss from leakage of sections of the Lineff system, he says: "To ascertain the surface leakage I applied the voltmeter test and found the following insulation resistances of three charged sections of the magnetic rail of the closed conduit: With the line clear and moist, 4,183 ohms; with the line very wet and covered with mud and water, 980 ohms.

"Taking 2,000 ohms as an average, the loss of power at 300 volts by surface leakage per car amounts to 45 watts."

Taking Mr. Kapp's figures for a basis of calculation, for 50 cars the surface leakage would be 2,250 watts, or about three horse-power. Now, as the potential universally used here is 500 volts, the loss by surface leakage for three sections would be 125 watts per car, or 6,250 watts for 50 cars. This would amount to about eight horse-power. It is, therefore, safe to conclude, if Mr. Kapp's data and experiments are correct, that the surface leakage would not be serious in the sectional-conduit systems.

The following are the requirements in order that a closed conduit-system may compare favorably with the trolley:

1st, Simplicity.
2d, Efficiency.
3d, Reliability.
4th, Small number of working parts.
5th, Low cost of construction.

Do any of the above proposed methods satisfy these conditions?

ELECTRICAL DEVELOPMENT IN JAPAN IN 1892.

BY S. KATOGI.

Knowing that Americans in general watch with interest Japan's progress in the industrial arts and the sciences, I thought the electrical people of your great country would be particularly interested to know what advances we have made here in the use of electricity in its various branches during 1892. I therefore give a summary of the record of that year, which reflects greatly to the credit of the Japanese people. It will be seen that some progress has been made in all the important applications of electricity, and while, of course, we cannot make anything like as good a showing as you did during the same period, yet you will agree with us that it is a very good record for a country so recently brought within the pale of christianity, with no experience or knowledge of its own in modern arts and sciences to profit by.

THE TELEGRAPH.

With the exception of a few private and railway lines, all the telegraph lines are owned and operated by the Japanese government. The total length of the government telegraph lines at the end of 1892 was 25,472 miles, No. 8 galvanized iron wire being used in the equipment. Of this total mileage 1,697 miles were erected during the year 1892, at the end of which period there were 546 offices, giving employment to 1,598 operators.

FIRE AND POLICE ALARM TELEGRAPH.

In Tokio city the system of fire and police alarm telegraph is a complete and growing one. The system of operation is the closed circuit, using a modified form of the Morse ink-writer, and the wire for the lines is No. 14 hard-drawn copper. The system was established in October, 1890, when a few instruments were experimentally connected. Since that time it has developed, and now there are 358 instruments in actual use in police stations, fire-engine houses, etc. The construction of the plant was completed in January, 1892. During that year 205 signals were turned in, 112 being fire alarms, and 93 burglar and other alarms.

THE TELEPHONE.

The telephone in Japan is, like the telegraph, owned and controlled by the government. It is a rapidly growing institution, as the following figures will show. The number of subscribers in Tokio and Yokohama is constantly increasing, the table given herewith showing the increase per month during the latter half of 1892:

	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Tokio.	997	1,063	1,122	1,171	1,240	1,299
Yokohama,	198	212	224	233	246	254

During the year a new telephone exchange building was built in Tokio. All of the modern improvements were put into it, including multiple switchboards made by the Western Electric Company. The wire tower, with a capacity for 2,000 lines, was also completed during the year. In its construction iron cross-arms were used. During December, 1892, there were a total of 240,868 calls at the Tokio exchange, an average of 7,769 for each of the 31 days of the month. These calls represent 925 subscribers. The operating force at the exchange consists of 37 day operators and 7 night operators. The day operators are all females, while the night operators are males.

ELECTRIC LIGHTING.

Two new electric-light companies were started during the year. One of these, the Hakone Electric Light Company, operates its plant by water-power. The Tokio city companies, of which there are 4, did a good and increasing business. The total increase in the number of incandescent lamps put in by the 4 companies in 1892, was 4,300 and a satisfactory extension of the alternating-current system is reported.

MINING.

Two copper mines are using electric power, and two or three others are now introducing it.

ELECTRIC RAILWAYS.

The electric railway near Tokio is nearly completed, and more rapid progress would have been made in its construction were it not for the fact that there is some question in connection with the work, involving the government railway regulations. The difficulties, however, promise to be settled soon. It is probable that the Short system will be used on this line.

WATER-POWER.

The Kyoto City Electric Light Company is operated very successfully by the water-power at that city. This power is owned by the government, and besides the operation of the electric-light plant, several factories use the current generated by the same power.

Mr. K. Iwadare, who is now in New York city, has many orders to fill for electric power for our famous mines.

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*See page 168, ELECTRICAL AGE (March 11, 1893), for description of this system.

LOOSE PULLEY-STAND AND FRICTION-CLUTCH PULLEY.

The accompanying illustrations show a loose pulley-stand as arranged for driving dynamos and a friction-clutch pulley with quill.

The loose pulley-stand (Fig 1.) is also applicable to saw-mills or to other machinery which stands at rest part of the time while the shaft remains in motion. When either a plain friction pulley or an ordinary loose pulley is used for this purpose the hub wears loose on the shaft, power is consumed and constant care is required to keep properly oiled and prevent heating and cutting.

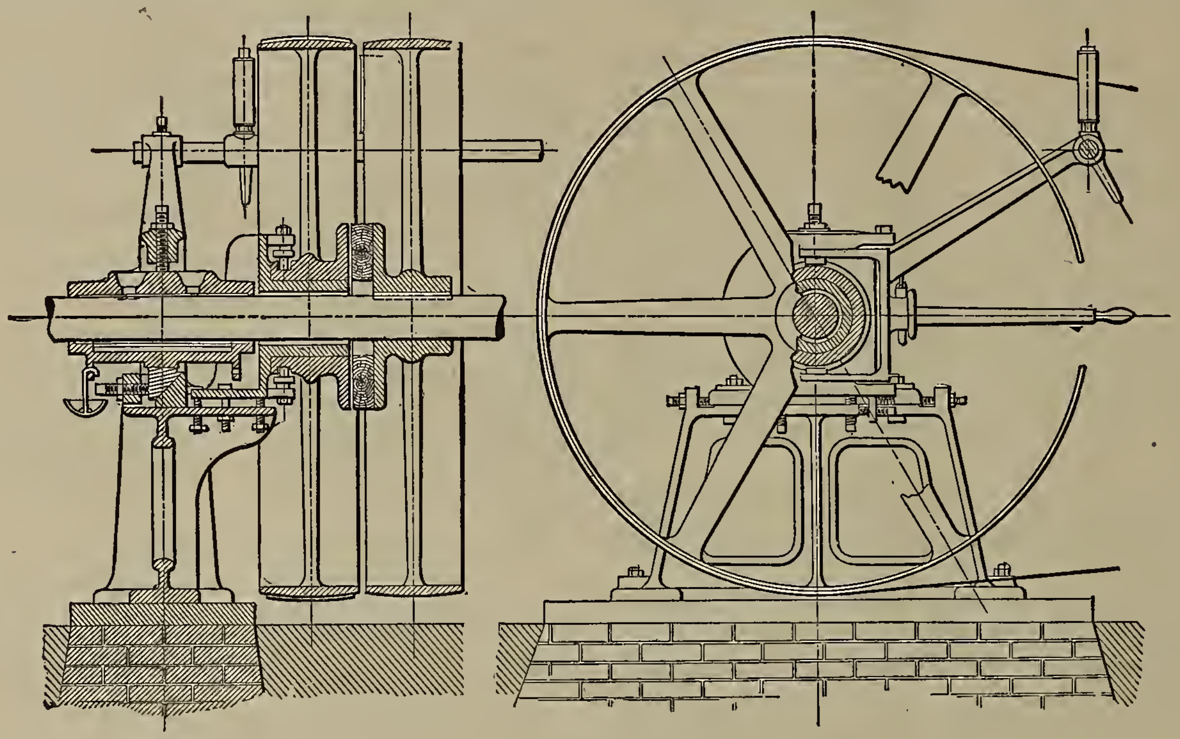
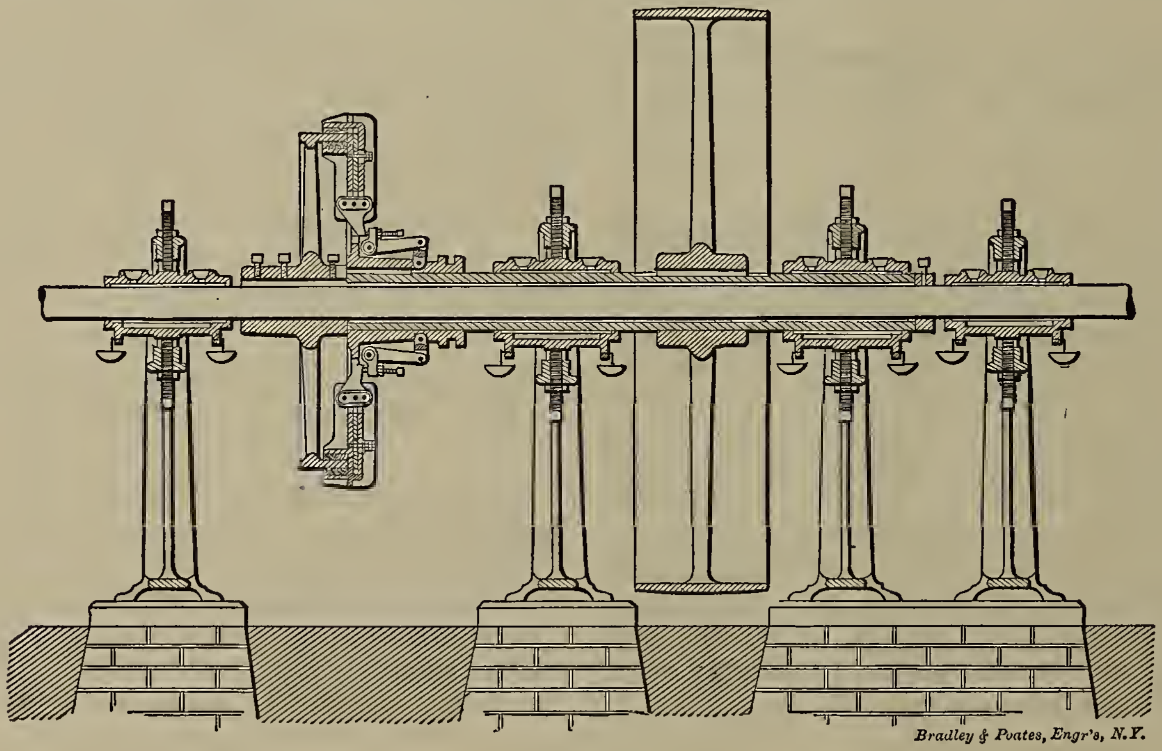


FIG. 1.

With the arrangement shown the loose pulley remains at rest on a fixed bracket, except while the belt is being shifted either on or off. The loose pulley, therefore, requires hardly any attention and the shaft is entirely relieved from belt strain when it ceases to drive the machine. To get the belt in motion so as to shift it off of the loose pulley the latter is forced over by a hand lever into contact with a friction disc attached to the fast pulley on the shaft. As soon as the belt is on the fast pulley the loose pulley is again allowed to come to rest.



Bradley & Poates, Engr's, N.Y.

FIG. 2.

Fig. 2 shows the friction-clutch pulley with quill.

When friction pulleys run loose on a shaft they consume power, wear loose in the hub, and require great care to keep properly oiled. The arrangement illustrated has none of these faults. It consists of a quill encircling the shaft and carrying the pulley and friction clutch. This quill does not touch the shaft but is carried by independent, self-oiling, adjustable bearings.

This device is especially recommended for dynamos and for other machinery which has to remain at rest part of the time while the shaft revolves.

When used for such they entirely relieve all running bearings from the belt strain when the machine is at rest.

The manufacturer of these devices, P. Pryibil, No. 543–555 West 41st street, New York, will give further particulars.

A TAX ON TELEGRAPH POLES.

In a recent decision of a court of Missouri it was held that the city authorities of St. Louis could, by ordinance, exact compensation from a company for using the streets for telegraph poles, a charge being laid on each pole erected. The Western Union Telegraph Company was the defendant in this action.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Everett, Mass.—The committee on street lights is of the opinion that an independent electric-light plant should be established in this city.

Grand Rapids, Mich.—The dynamos in the electric-light works of this place have been ruined by the recent floods.

Hammonton, N. J.—The council has agreed to pay $1,000 a year for lighting the streets of this town, and an electric-light company is being formed.

Kansas City, Mo.—The Kansas City Electrical Works will apply for a franchise for a plant in the southern part of the city to supply light and power.

Napoleon, O.—The city council has decided to advertise for bids for putting in water-works and an electric-light plant.

New Paynesville, Minn.—George R. Stephens, S. E. Rugland and Angus Haines have been appointed as a committee to raise a bonus of $5,000 for the purpose of constructing an electric-light plant in this village.

North Attleboro, Mass.—The committee appointed to investigate the subject of electric lighting for this town has come to the conclusion that the most effective and cheapest method is for the town to establish its own plant.

Pelham, Ga.—This place proposes to establish a municipal electric-light plant.

Port Henry, N. Y.—It is proposed to issue $20,000 bonds for the purpose of purchasing a site for an electric-light plant for this town.

Rockport, Mass.—It is expected that this town will install its own electric-light plant for lighting the streets.

Sea Cliff, N. Y.—Henry Stanton, of Roslyn, has asked for the privilege of erecting poles and stringing wires for the purpose of furnishing electric light to this village.

Watertown, N. Y.—It has been decided to adopt municipal electric lighting in this city.

Wenatachee City, Wash. — The question of lighting this city by electricity is being discussed.

NEW CORPORATIONS.

Augusta, Me.—Application has been made for incorporation by the Glidden Water, Illuminating and Power Company.

Bartlett, N. H.—The Bartlett Electric Light and Power Company has petitioned for incorporation.

Chicago, Ill.—The Electric Propeller Company. Capital, $200,000. Incorporators: William C. Marshall, Jr., David C. Kling and Louis C. De Proft.

Columbia, Pa.—The Columbia Traction Company. Capital, $10,000. Directors: William B. Given and Harry S. Given, of this city; Michael Reilly, Edward McGovern and John A. Coyle, of Lancaster.

Columbus, O.—The Columbus Central Railway Company has filed articles of incorporation. Capital, $1,500,000. Incorporators: John J. Shipherd, Thomas Jopling, Frank W. Merrick, John Ehrhardt and Ernest W. Radder.

Dallas, Ore.—The Dallas, Dufer, Kingsley, Tygh Valley and Wamic Telephone Company. Capital, $1,400. Incorporators: M. A. Gordon, T. M. Driver and L. P. Dorias.

Jacksonville, Ill.—The Springfield, Jacksonville and Winchester Electric Railway Company. Capital, $3,000,000. Incorporators: James F. C. Self, George Huffaker, John Gobbs and Samuel S. Dewes.

Lancaster, Pa.—The Lancaster Traction Company. Capital, $25,000. Directors: A. D. Rohrer, B. J. McGrann, J. W. B. Bausman, Edward McGovern, M. L. Herr, J. B. Long, John C. Hager, Walter M. Franklin, Michael Reilly, John A. Coyle, Lancaster; James Young, Middletown.

Melrose, Mass.—The Boston, Malden and Stoneham Street Railway Company has been granted permission by the selectmen of this town to lay tracks through Washington Street from Stoneham to the Malden line.

Orange, N. J.—Boston capitalists have organized the Suburban Traction Company which will consolidate with the Orange Valley Street Railway Company and the Orange Cross Town and Bloomfield Street Railway Company. Capital, $3,000,000.

Penaquid, Me.—The Penaquid, Damariscotta and Newcastle Street Railway Company has petitioned for incorporation.

Pen Argyl, Pa.—The Pen Argyl, Bangor and Water Gap Electric Railway Company. Capital, $300,000. A. J. Stroh, of Sunbury, is president.

Philadelphia, Pa.—The Philadelphia and Allentown Electric Trunk Railway Company. Capital, $1,000,000. W. R. Grace, of New York city, is president of the company.

Portland, Me. — The Portland and Yarmouth Electric Railway Company has petitioned for incorporation.

Pottsville, Pa.—Citizens' Electric Railway Company. Capital, $200,000. Directors: L. R. Keefer, R. H. Koch, J. H. Zerbey, P. K. Filbert, C. R. Acker and R. A. Zerbey.

Peoria, Ill.— The Portable Electric Light and Power Company. Capital, $250,000. Incorporators: Anson C. Tichenor, Isidore Mantz, Robert H. Walker and Frank Covey.

San Francisco, Cal.—Pacific Electric Regulator Company. Capital, $500,000. Directors: Henry W. Chase, J. Preston Moore, John H. Hanify, W. C. Starr, John P. Miller.

South Milwaukee, Wis.—The South Milwaukee Light and Power Company. Capital, $15,000. Incorporators: Frank H. Brice, William W. Williams and A. W. Bell.

South Paris, Me.—The Snow's Falls Electric Manufacturing Company has been organized with a capital of $60,000. Officers: President, John F. Stanley, Paris; treasurer, Fred J. Wood, Paris.

Stratford, Conn.—The Stratford Electric Light Company has petitioned for incorporation.

Waldoboro, Me.—The Waldoboro Water Electric Light and Power Company has petitioned for incorporation.

PERSONAL.

Frederick Sargent, Chicago, Ill., has resigned the position of chief electrician and mechanical engineer of the World's Fair.

Mr. Alfred E. Kornfeld, who has for the past year or more been connected with the Electrical Age and Street Railway News, has resigned to accept a position with the *Street Railway Gazette*, of Chicago. For the present Mr. Kornfeld will remain in New York. He is a hard and conscientious worker, and no doubt will do well in his new field.

NOTES OF GENERAL INTEREST.

A committee has been appointed by the council of Altoona, Pa., to investigate the subject of municipal lighting for that city.

Capitalists from Connecticut and Minnesota have a scheme on foot to convert the Tallulah river into motive-power to furnish electricity to run the manufactories of northwest Georgia.

The Washington Gas Company, Indianapolis, Ind., has ordered its gas-meters removed from the business houses where the electric-light fixtures have been put in, its intention being to supply houses that use gas and nothing else. The business men are very indignant.

Mr. John Ferguson, a line-man in the employ of the North Plainfield (N. J.) Electric Light Company, was shocked while at work on the top of a pole and fell, receiving serious injuries, from which he died on March 9.

The three electric-light companies of Pueblo, Col., have consolidated, and the new company has sent circular letters to its patrons announcing an advance of about 60 per cent. in the cost of electric lights.

The Edison Electric Light Company, which is a stockholder in the Scranton Illuminating, Heat and Power Company, Scranton, Pa., has brought suit against the officers of the latter company, claiming that they have been illegally elected.

Word from Grand Rapids, Mich., states that the recent flood submerged the electric-light works, and the twelve dynamos were ruined.

The West Michigan Electric Company has given a contract for the machinery, wiring and other things necessary for its power plant, which is to supply Grand Rapids, Mich., with electricity. The specifications call for a 1,000 horse-power dynamo. The Siemens & Halske Electric Construction Company is to supply the material under the contract.

The directors of the Elektron Manufacturing Company, Springfield, Mass., have chosen the following officers: President, John A. Barrett, New York; vice-president, W. E. Wright; treasurer and manager, E. H. Cutler; secretary, J C. Reilly, Brooklyn.

The Des Moines Water Power and Electric Light Company and the Des Moines Edison Light Company, Des Moines, Ia, have consolidated under the name of the Des Moines Electric Company. Capital, $600,000. Officers: President, Fred D. Goode; vice-president, B. E. Sunny; secretary, J. A. Colby; treasurer, V. F. Newell, and they with Lowry W. Goode, J. I. Beggs and N. W. Jordan constitute the board of directors.

Charlevoix, Mich., proposes to furnish its own electric light and power.

Curtis & Dean, of New York, have been granted the privilege of erecting a plant and furnishing electric light and power to Glen Cove, N. Y., and other villages.

The Boston and Maine Railroad Company is going to try an electric locomotive on the Crescent Beach branch. The trolley system is to be used.

The recent decision of Judge Colt, of Boston, in favor of the Edison Electric Company has made it impossible for the Perkins Lamp Company, Manchester, Conn., to resume business. The lamp company is trying to dispose of its plant.

Lecture.—On March 24 Mr. George G. Hopkins, M.D., will lecture on the subject of "Electricity in Medicine" before the Department of Electricity of the Brooklyn Institute of Arts and Sciences. The lecture will be held in the large hall of the Y. M. C. A. building at 8 P.M., and will be illustrated by apparatus.

NEW BOOKS.

The Voltaic Cell, Its Construction and Its Capacity. By Park Benjamin, LL.B., Ph.D. John Wiley & Sons, New York. 562 pages, with numerous illustrations and diagrams. Price, $5.

The production of cheap electricity is a subject that is receiving much attention from scientists and electrical engineers, and the voltaic cell offers a most interesting field for further development. Mr. Benjamin evidently has great faith in the possibilities of the voltaic cell, and points out the direction in which its future development may be made. When carbon is economically burned in the voltaic cell, he says, the era of cheap electricity will have arrived.

The object of this work is to assist the student and investigator in the effort to solve this problem by placing before him the record of the principal discoveries and researches relating to chemical generators of electricity, descriptions of many of the most distinctive and approved types of cells, and the latest knowledge as to their efficiency, measurement and modes of use.

The book opens with a chapter on the beginning of the voltaic cell, and then gives the various rules for electrical measurement. Single, double fluid and other types of cells are exhaustively considered in every aspect, and there is a fund of information relating to accumulators or storage cells. Many tables and a large mass of practical data are given that will be found of very great value to all interested in the subject directly or indirectly. The book is the focus point of all past and present knowledge on this interesting subject, and is one of the most important of its kind ever published. The literature of the voltaic cell is not at all voluminous, but this work will doubtless supply every deficiency in this respect. It ought to find its way into every electrical library.

FALSE REPORT.

On March 11, the announcement was made that the Sawyer-Man Illuminating Company had filed a petition in the Supreme Court for voluntary dissolution, with assets of $4.60, and liabilities nothing. The *Electrical World* in its issue of March 18 committed a very serious blunder in announcing that the Sawyer-Man Electric Company was the petitioner. The real facts in the case are that the Sawyer-Man Electric Company has nothing whatever to do with the Sawyer-Man Illuminating Company. The latter was an entirely different concern, and how the *World's* editor got things so badly mixed will have to be explained by that gentleman himself. Errors of much less consequence than this one have proved very costly to the parties committing them as well as the ones injured, and the effect of this particular piece of carelessness cannot be otherwise than unfavorable to the Sawyer-Man Electric Company.

TRADE NOTES.

Queen & Co, Incorporated, Philadelphia, report a steady demand for their standard portable testing resistance sets which enjoy a national reputation and are used in foreign countries. This applies especially to "No. T305," which is said to be recognized as the most efficient portable apparatus for practical work on the market. It can be used anywhere and everywhere, and is absolutely invaluable in locating faults or grounds in electric-light, telegraph or telephone wires.

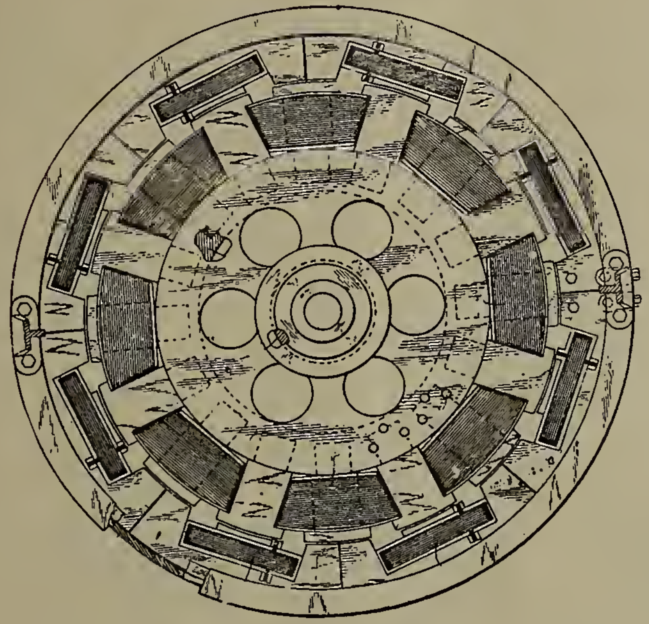
The Hill Clutch Works, of Cleveland, Ohio, has issued a valuable vest pocket combination daily calendar and memorandum-book for this year. Besides these features it gives the population of cities in the United States and foreign cities, postal information, etc., etc.

The Electrical Age's Illustrated Record of Patents.

Issued March 14, 1893.

493,243. Electric Switch. William F. Bossert, Utica, N. Y., assignor to the Utica Electrical Manufacturing and Supply Company, same place. Filed Feb. 17, 1892.

493,245. Ear Attachment for Telephones. George McC. Brown, Nashville, Tenn., assignor of one-half to Edward James Cahill, La Salle, Ill. Filed June 23, 1892.



493,313.—DYNAMO-ELECTRIC MACHINE.

493,253. Signalling-Telegraph. William E. Decrow, Boston, Mass. Filed Nov. 14, 1892.

493,277. Method of Electro-Depositing Metals. Orazio Lugo, New York, N. Y., assignor to the Cosmic Alloy and Metal Depositing Company, of New Jersey. Filed Jan. 8, 1892.

493,304. Telephone-Index. Stillman L. Shaffer, Worcester, Mass. Filed Oct. 25, 1892.

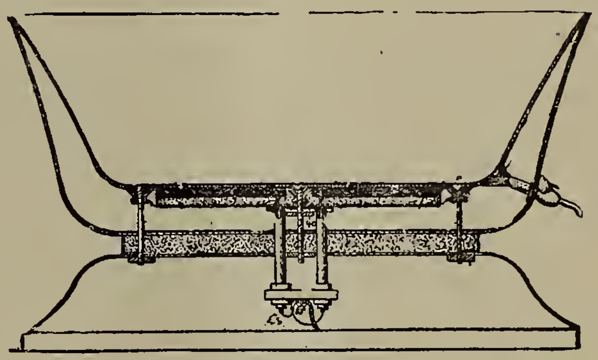
493,313. Dynamo-Electric Machine. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed July 28, 1891.

493,314. Lightning-Arrester. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company, of New York. Filed Oct. 28, 1892.

493,328. Multiple Terminal Cut-Out. Lark P. Bonebrake, Maryville, Mo. Filed Nov. 10, 1892.

493,337. Armature for Dynamo-Electric Machines. Horace F. Parshall, Lynn, assignor to the Thomson-Houston Electric Company, Boston, Mass. Filed Sept. 15, 1892.

493,349. Armature for Motors and Generators. Norman C. Bassett, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed July 9, 1891.



493,422.—ELECTRICALLY-HEATED VESSEL.

493,358. Electric Search-Light. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Sept. 16, 1891.

493,359. Electric-Arc Lamp. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Sept. 1, 1892.

493,360. Electric-Arc Lamp. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Oct. 14, 1892.

493,361. Switch for Electric Motors. Moritz Immisch, London, England, assignor to the Immisch Electric Navigation and Power Company, of New Jersey. Filed Nov. 21, 1891. Patented in England Sept. 7, 1889.

THE

"CLARK" WIRE.

TRADE MARK.

"CLARK" WIRE.

Insulation Guaranteed wherever used, Aerial, Underground or Submarine.

In a letter from the Inspector of the Boston Fire Underwriters' Union, he says:

"A thoroughly reliable and desirable Wire in every respect."

The rubber used in insulating our wires and cables is especially chemically prepared, and is guaranteed to be waterproof, and will not deteriorate, oxidize or crack, and will remain flexible in extreme cold weather, and is not affected by heat. The insulation is protected from mechanical injury by one or more braids, and the whole slicked with Clark's Patent Compound, and special extra finish, which we have now adopted for all our solid wires as an extra weatherproof protection, and also preventing chafing and abrasion, which is water, acid, and to a very great extent fireproof. Our insulation will prove durable when all others fail. We are prepared to furnish Single Wires of all guages and diameter of insulation for Telegraph and Electric Lights from stock. Cables made to order. We are now prepared to furnish our Clark Wire with a white outside finish for ceiling cleat work as well as our standard color.

Clark Joint Gum should be used for making waterproof joints. This is put up in half-pound boxes, in strips about one foot long and five-eighths inch wide, and when wrapped about a joint and pressed firmly it makes a solid mass. **FOR RAILWAY** and **MOTOR** use we make all sizes of stranded and flexible cables with Clark insulation.

WE GUARANTEE OUR INSULATION WHEREVER USED. AERIAL, UNDERGROUND OR SUBMARINE, and our net prices are as low, if not lower than any other first-class Insulated Wire. We shall be pleased to mail Catalogues with terms and discounts for quantities.

TRADE MARK.

"CLARK" WIRE.

EASTERN ELECTRIC CABLE CO.,

61 to 65 Hampshire Street, Boston, Mass.

HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician

PATENTS.—Continued.

493,422. Electrically-Heated Vessel. John V. Capek, New York, N. Y., assignor of one-half to Edward H. Johnson, same place. Filed Dec. 14, 1891.

493,425. Electric Locomotive. Thomas A. Edison, Llewellyn Park, N. J. Filed Jan. 19, 1891.

493,426. Apparatus for Exhibiting Photographs of Moving Objects. Thomas A. Edison, Llewellyn Park, N. J. Filed Aug. 24, 1891.

493,431. Electric Motor for Dental Work. Jeremiah Keller, Canton, Ohio. Filed June 6, 1892.

493,434. Insulator-Pin. Fred M. Locke, Victor, assignor of one-half to George Arthur Paddock, Auburn, and Willard Cohn Page, Palmyra, N. Y. Filed Sept. 29, 1892.

493,439. Commutator for Dynamo-Electric Machines and Method of Constructing Same. Alexander W. Meston, St. Louis, Mo., assignor to the Emerson Electric Manufacturing Company, of Missouri. Filed Sept. 12, 1892.

493,446. Support for Electric Lamps. John R. Protzman, Streator, Ill. Filed Sept. 17, 1891.

493,447. Armature Connection for Dynamo-Electric Machines. George A. Rollins, Chicago, Ill. Filed Feb. 16, 1892.

493,485. Electric Switch. Andrew M. Coyle, Baltimore, Md., assignor to the Standard Screw Elevator Manufacturing Company, same place. Filed March 3, 1892.

493,558. Telethermometer. Leroy S. Norton and Frank E. Hoffman, Alpena, Mich.; said Hoffman assignor to said Norton. Filed Oct. 31, 1892.

493,578. Electric-Lamp Supporter. Alvin G. De Witt, Detroit, Mich. Filed Feb. 7, 1891.

493,602. Electric Controlling Device. Thomas W. Shepherd, Peabody, Mass. Filed Oct. 24, 1891.

493,618. Electric-Railway Conduit and Contact. Joel Davis and Reuben M. Huntington, Denver, Col. Filed Oct. 2, 1891.

493,620. Telegraph-Relay. Samuel P. Freir, East Orange, N. J., assignor to the Western Union Telegraph Company, of New York. Filed Dec. 15, 1891.

493,623. Electric-Railway System. Thomas Harris, Detroit, Mich., assignor, by mesne assignments, to the Harris Electrical Propulsion Company, Limited, same place. Filed Jan. 8, 1892.

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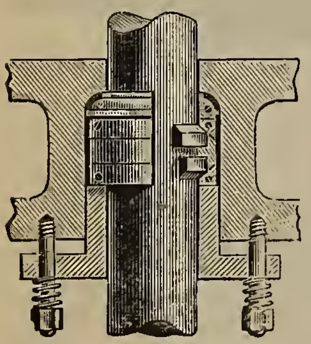

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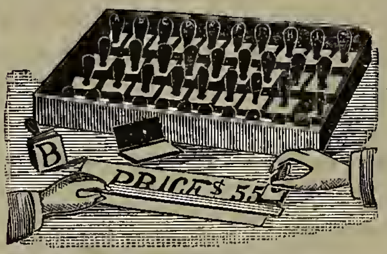

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ELECTRICAL AGE

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NEW YORK, APRIL 1, 1893.

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DIRECT CURRENTS FOR LONG DISTANCE TRANSMISSION OF POWER.

The long distance transmission of power by direct currents is a subject that has received considerable attention of late from electrical engineers, and the results so far attained show that under proper conditions it is quite as practicable as the alternating system. The paper read by Mr. Charles S. Bradley, at the recent convention at St. Louis of the National Electric Light Association, threw a good deal of light on this interesting subject, and this paper, in connection with the abstract published on another page of this issue, of Mr. Frank Kitton's paper read at a recent meeting of the Buffalo Electrical Society shows that a great deal of attention is being given to this use of direct currents. It is evident, however, from what Mr. F. C. Perkins states that long distance transmission by this system has received greater attention on the continent than it has in America. At least they are ahead of us in the practical application, as shown in the successful plants of this character now in operation in various parts of continental Europe.

STEAM POWER.

No other subject concerns electric light and power station managers more than that of obtaining the greatest mechanical power from the least consumption of coal. This, of course, involves the use of engines and boilers, and upon the perfection of this depends entirely the economy in obtaining the power from the coal. The paper read by Dr. C. E. Emery at the meeting of the American Institute of Electrical Engineers last week gives a good many valuable facts concerning engines and boilers with this object in view, and it is worth the very careful consideration of those interested.

GAS AND ELECTRIC LIGHT IN MASSACHUSETTS.

The report of the Board of Gas and Electric Light commissioners of Massachusetts for the year ending June 30, 1892, just issued, is a document of extreme interest. It is a voluminous report, and presents every detail of the two industries in tabulated form and in so complete a manner as to leave nothing desired. The results show very favorably indeed for electric lighting in that State. A very substantial aggregate increase in the business and revenues is demonstrated, and if any one cares to go into the details as to how electric lighting affects the gas industry in this one State he should obtain a copy of this report and study it carefully. It is well worth very careful thought.

TELEPHONE LEGISLATION.

There is a bill before the miscellaneous corporation committee of the New York State Senate providing for the creation of a State telephone commission to regulate telephone rates in this State. It is reported, however, that in all probability there will be no telephone legislation at this session of the Assembly. In an effort by Senator McMahon to secure action by the committee on the bill, it was developed that Chairman Plunkett is unalterably opposed to it, and that he has stated that there was no demand for lower telephone rates. It is quite evident that he is not in touch with the sentiment of the business community in this matter. If he is reported correctly as stating that there is no demand for lower rates he is very much mistaken. There is, indeed, a very strong demand for lower rates but, of course, as long as the telephone business is a monopoly, and unless the legislature interferes, there is no way of escape from the heavy exactions of the telephone company. If you must have a telephone you must pay for it. To those who maintain that there is no call for lower rates we respectfully call attention to the copy of the resolutions, (which is published on another page,) passed on March 22 by the New York Mercantile Exchange. These resolutions tell their own story, and any one who asserts that telephone subscribers are satisfied under the existing state of affairs are entirely in the wrong.

ELECTRIC HEATER FOR CARS.

If cars can be moved and lighted by electricity the question naturally arises, even in the minds of those who know nothing about electrical matters, why can they not be heated by the same power as well? This is a logical sequence of the two first named facts, and why cars are not heated by electricity more than they are, are questions that puzzle many people. In this article we will attempt to describe a system of electric heating that offers many advantages and possesses features that are worthy of the very careful consideration of electric street railway managers.

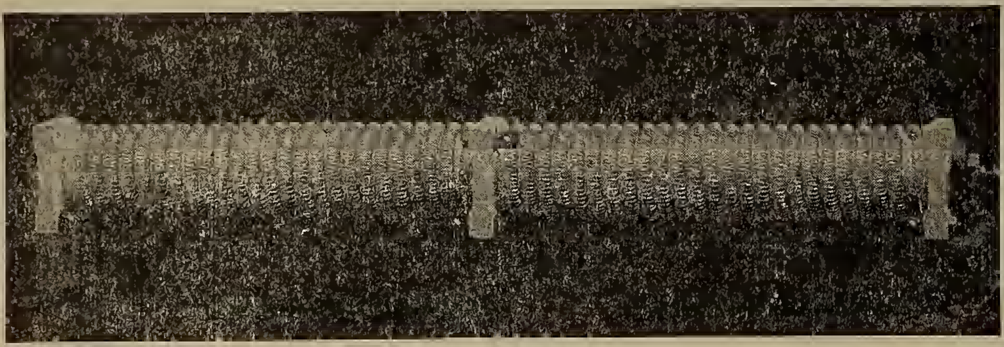


FIG. 1.

The transformation of electrical energy into heat is accomplished by the passage of the electric current through a conductor with electrical resistance. The amount of the heat thus generated is calculable in a given case, and is determined by multiplying the square of the current by the resistance of the conductor ($H = C^2 R$). If we place a wire offering resistance to a current between two conductors in which a given difference of potential is maintained, the amount of heat given off is proportional to the current used. This is the principle upon which the electric heater of the Consolidated Car Heating Company of Albany, N. Y., is based. The resisting conductors of this heater are so divided as to admit of any desired combination according to the necessities, and giving out various intensities of heat.

In construction, the heater consists of a cylindrical glazed porcelain insulator, on the surface of which is formed a spiral groove, from one end to the other, the resisting wire being placed in these grooves.

Figure 1 shows the appearance of one of these heaters. It is divided midway between the ends by a glazed porcelain plate provided with binding screws, to which the ends of the wires of the adjacent coils may be connected.

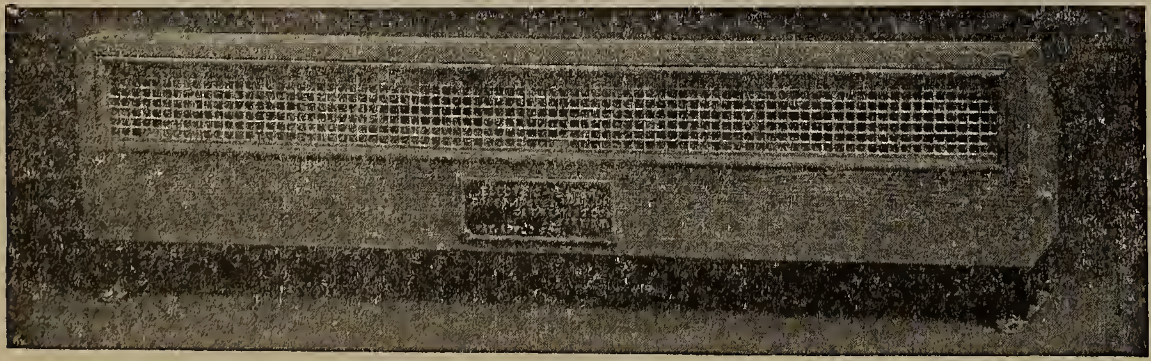


FIG. 2.

This division of the wire on one heater is to permit a change of combination of connections. The ends of the heater are supported by cast iron frames, by which supports the heater is fastened to the car floor and at the same time they provide means for attaching the covering box.

The covering box is constructed of wood lined throughout with asbestos mill-board, and in one of its sides is a screened opening for the purpose of allowing a circulation of air. The appearance of the heater so covered is shown in fig. 2, and the box may be made in wood of any desired kind and finish.

Galvanized wire is used on these heaters for the purpose of preventing oxidation, even at high temperatures; the use of high temperatures in this system, however, is not contemplated. To accomplish the desired results a wire of considerable length is used, thus presenting a large surface, with a low potential current. The company reports it has never yet lost a heater through the oxidation of the conducting wire, and that this feature of the system is one of its strongest points. In case, however, of damage to the wire from any cause, it can be easily removed and quickly replaced by a new one.

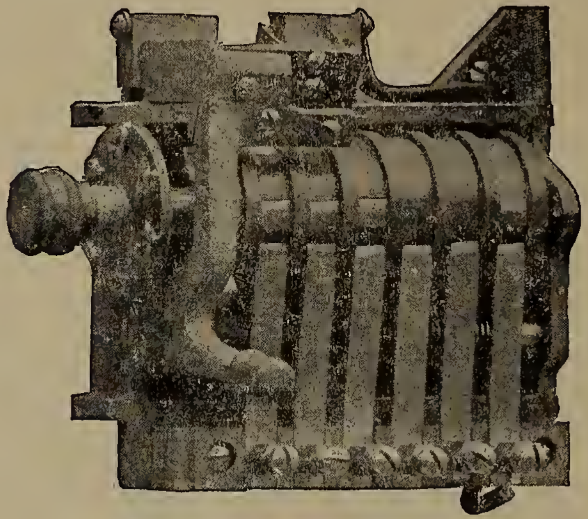


FIG. 4.

Six heaters are placed on each car, three on each side, under the seats, as shown in fig. 3. The heaters are placed with the view of even distribution of heat, and by placing them in the lower part of the car, on the floor, the passengers get the benefit of the heat as it rises to the top of the car.

In cars provided with panelled risers under the seats, the heaters are placed within the risers so that the front of the heaters with its grated openings takes the place of the panel.

One of the most commendable features of this heater is its cleanliness. The air heated by it is not vitiated in the least, nor is it scorched, because the heat of the wire and of the surrounding porcelain support is not sufficient to produce any such effect; therefore the heated air is as pure as it was before heating. Other obvious features of this heater are, absence of coal, ashes, dust, and all the accompaniments of coal stoves, besides the great economy effected in space. The heaters being placed under the seats, the seating capacity of the car is in nowise diminished.

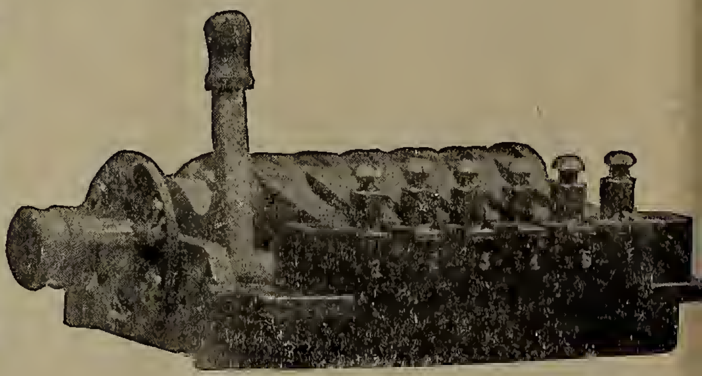


FIG. 5.

Figs. 4 and 5 show front and side views of the Temperature Regulating Switch which comprises a part of the system. It has six different positions, ranging from open current (no heat) to the greatest heat, the intermediate positions giving different intensities of heat.

The switch effects different combinations of the heaters so as to increase or decrease the flow of current to produce the heat required.

In construction the switch consists of a cylinder of insulating material which carries in fixed position on its circumference pieces of conducting metal. Proper connections of the metal contacts are made through the substance of the insulating material itself.

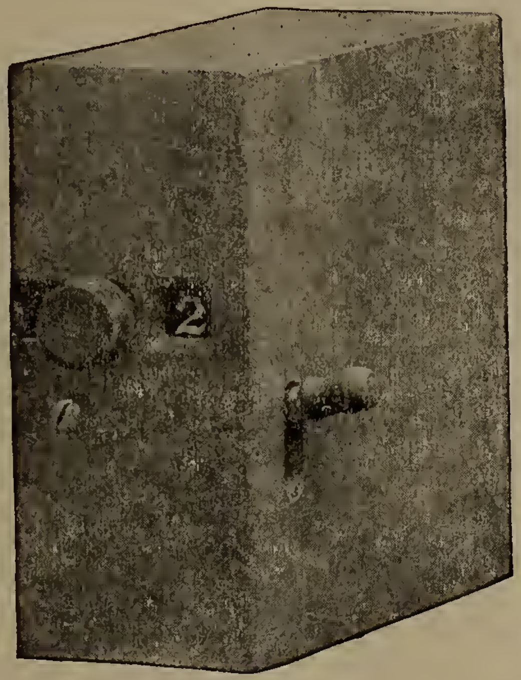


FIG. 6.

The wires connecting the heaters in the several combinations necessary to obtain the different intensities of heat, are connected to binding posts in the switch and terminate in multiple spring contacts resting upon the surface of the cylinder carrying the contacts above described.

To prevent sparking across the face of the cylinder in moving the switch from one position to another, it is necessary that one combination be broken before the next combination is made. To accomplish this, the following construction has been adopted:

A notched wheel is attached at one end of the cylinder, the notches being six in number, and corresponding to the six positions of the switch. There is also provided a rock shaft carrying a lever at one end at the side of which lever is a lug fitting in the notches above mentioned, in such a way that when the lever is pushed forward to its normal position, the lug enters the notch and prevents rotation of the cylinder. By throwing the lever back the lug is withdrawn from the notch and the cylinder is then free to turn in either direction. This lever has attached to it an insulated arm which projects through the switch cover so that the lever can be operated without removing the cover of the switch. At the long end of the lever above described there is attached a U shaped piece of metal by means of insulating material which closes the circuit from the trolley to the switch, making a double contact.

These switches are protected by a cover of wood, made to harmonize with the woodwork of the car. Fig. 6 shows an exterior view of an incased switch.

Now we come to the question that concerns the railway manager more than any other, and that is, what is the cost of operation?

The amount of current consumed of course depends upon the amount of heat desired, being proportional to the amount of heat generated. The least heat that can be obtained by the use of these heaters on a 500 volt circuit is that obtained from a 2-ampère current, while the maximum amount requires 12 ampères. It has been found that sufficient heat has been obtained in freezing weather by placing the switch in the third position, which takes about 6 ampères of current.

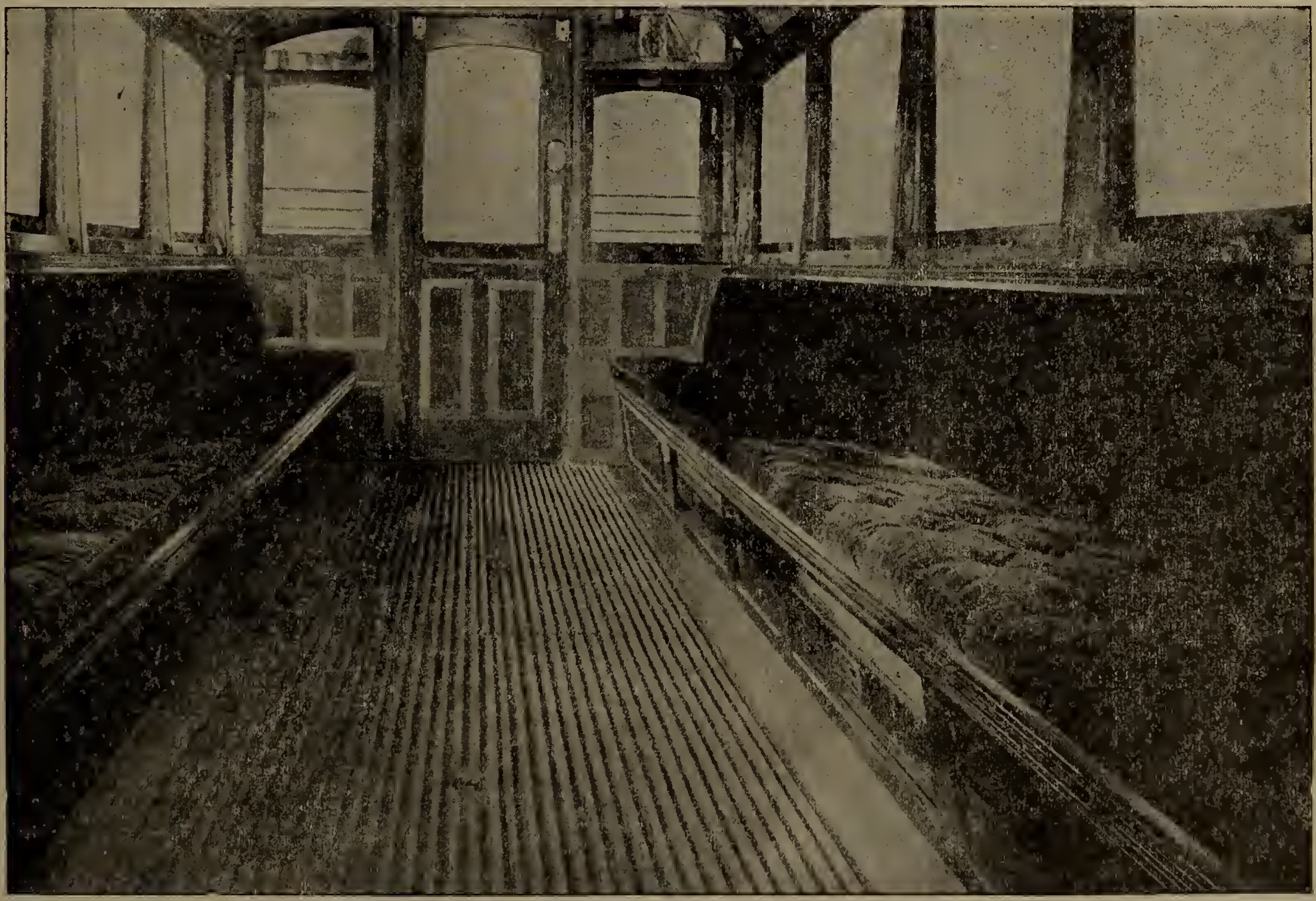


FIG. 3.

As to the cost of heating a car with the electric heater, it is evident that the cost must be calculated by the quantity of current consumed. As this quantity varies with the variable electro-motive force carried on most street car lines, it is evident that the actual electrical energy consumed is a matter not readily determined. If the number of ampère hours on a five-hundred volt circuit can be once determined, and the cost of an ampère-hour on the same circuit is known, the cost of running the electric heater can be easily ascertained. On most street car lines the total cost of an ampère-hour on a five-hundred volt circuit is about one-half of a cent. This includes all costs of current, including fuel and water bills, oil and waste, services of employés, repairs to machinery, etc., etc.

The following are the dimensions and weight of a heater: Length, 30 5-8 inches; height, 8 7-8 inches; depth, 6 5-8 inches; wire in each heater (spirally coiled) 625 feet; wire in a set of six heaters, a car equipment, 2,550 feet; weight of each heater 23½ pounds; weight of regulating box and switch 8½ pounds; weight of car equipment complete, 149½ pounds.

THE "TELAUTOGRAPH."

During the afternoon of March 21 last, a "press" exhibition of Prof. Elisha Gray's "Telautograph" was given simultaneously in New York and in Chicago. The New York exhibition took place at the Company's offices, No. 80 Broadway, and the officials present were kept busy between the hours of 2:30 and 5 o'clock showing the operation of this interesting invention to the many representatives of the press, including one from the Electrical Age.

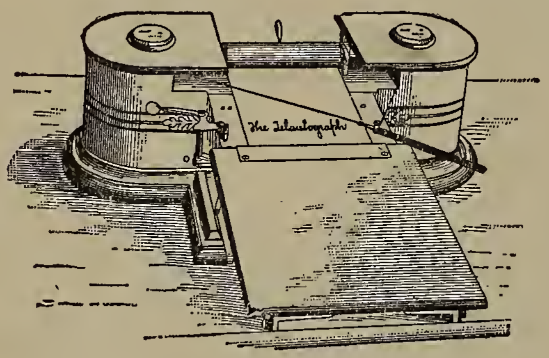


FIG. 1.

The operation of the instruments in each city was merely local, and not between the two places. At New York there was placed in the circuit resistance to equal about that of one mile of wire, and the operation of the instruments was shown on the Exchange system. Several instruments were disposed about the various offices of the Company, and by signaling the "central" office any one of them could be placed in communication with any other by the operator at the central office, or "exchange." In this respect, the system is similar to the telephone, and subscribers can thus communicate with each other by the "Telautograph," or writing machine, just as they do now by telephone.

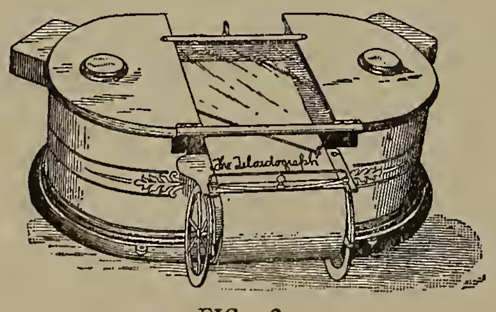
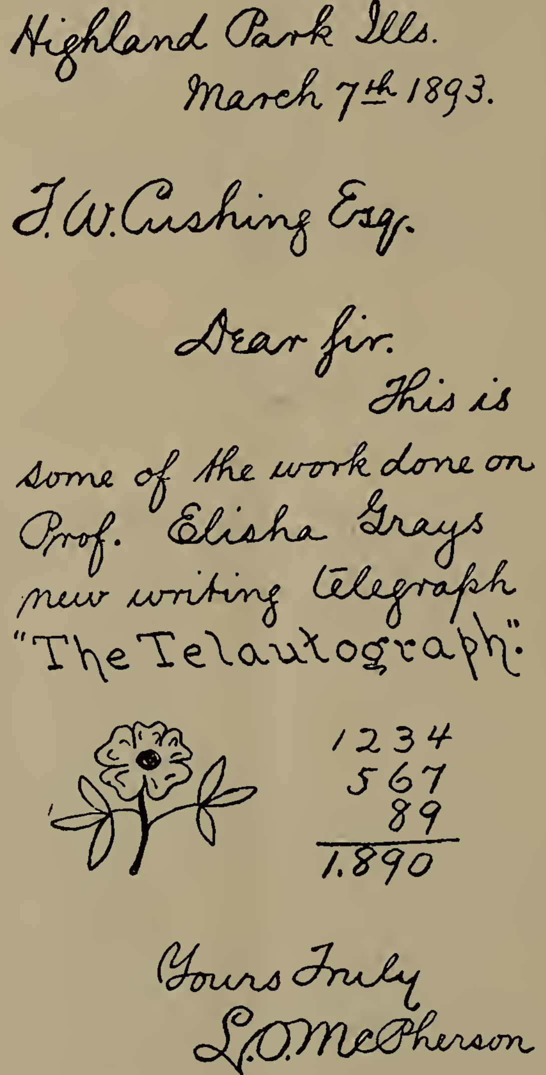


FIG. 2.

The exhibition was a complete success as far as the operation of the instruments was concerned, and the ease with which they worked excited very deep interest. That no especial training was necessary to operate the instruments was demonstrated by several of the press representatives trying it for themselves, with uniform success in every instance. The Electrical Age representative wrote a few lines which were accurately reproduced on the receiver, and he tried to delve further into the mechanism of this ingenious invention, but this privilege was denied to all. We are enabled, however, to present to our readers illustrations of the transmitter and receiver, besides others which will be duly referred to.

The following description of the instruments and their operation will be of interest.

The "Telautograph" consists of a transmitter and a receiver associated for use at one station. The structure of these instruments is remarkably simple, and the mode of operation is in all respects direct and positive. The methods for transmitting the electric impulses to the line, and then converting them, in the receiver, into the corresponding movements of the automatic pen, are all alike distinguished by simplicity and directness. They are all of a positive character, and are therefore not dependent upon, or influenced by, accidental changes in conditions.



Highland Park Ills.
March 7th 1893.

J. W. Cushing Esq.

Dear Sir.
This is
some of the work done on
Prof. Elisha Grays
new writing telegraph
"The Telautograph".

1234
567
89
1.890

Yours Truly
L. O. McPherson

FIG. 3.

In the transmitter (Fig. 1) an ordinary lead pencil is used, near the point of which two silk cords are fastened at right angles to each other. These cords connect with the instrument, and, following the motions of the pencil, regulate the current impulses which control the receiving pen at the distant station.

The writing is done on ordinary paper, five inches wide, conveniently arranged on a roll attached to the machine.

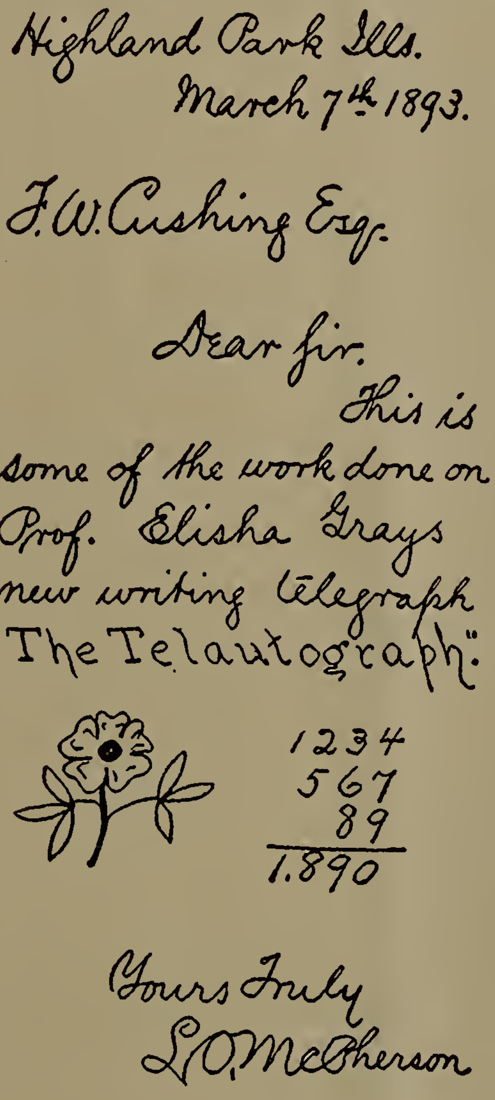
A lever at the left is so moved by the hand as to shift the paper forward mechanically at the transmitter, and electrically at the receiver.

The receiving pen on the receiver (Fig. 2) is a capillary glass tube placed at the junction of two aluminum arms. This glass pen is supplied with ink which flows, from a reservoir, through a small rubber tube placed in one of these arms.

The electrical impulses, coming over the wire, move the pen of the receiver simultaneously with the movements of the pencil in the hand of the sender.

As the pen passes over the paper, an ink tracing is left, which is always a fac-simile of the sender's motions, whether in the formation of letters, words, figures, signs or sketches. Figs. 3 and 4 show samples of the work; Fig. 3 showing the writing as done on the transmitter; Fig. 4 representing the same matter reproduced on the receiver.

The following are some of the many uses to which the Telautograph may be applied: with the Telautograph a business man may conduct his ordinary correspondence and transact matters of importance, without the medium of an operator. From his office he can send instructions to his factory—close by or many miles distant—having the same delivered in his own hand-writing. In like manner, he can receive, at his office, daily or hourly reports from his factory.



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567
89
1.890

Yours Truly
L. O. McPherson

FIG. 4.

A broker, dealing by wire, can give quotations, and execute orders to buy and sell securities, without danger of dispute.

Important negotiations may be carried on between two parties, widely separated, and a memorandum of agreement drawn up and signed by each, without the parties coming together.

A physician may wire his prescription to the druggist—using the arbitrary code of the profession—in the confidence that no mistake will be made in the transmission.

A reporter, writing up a fire or railroad accident, can send to his paper a sketch of his subject, taken on the spot.

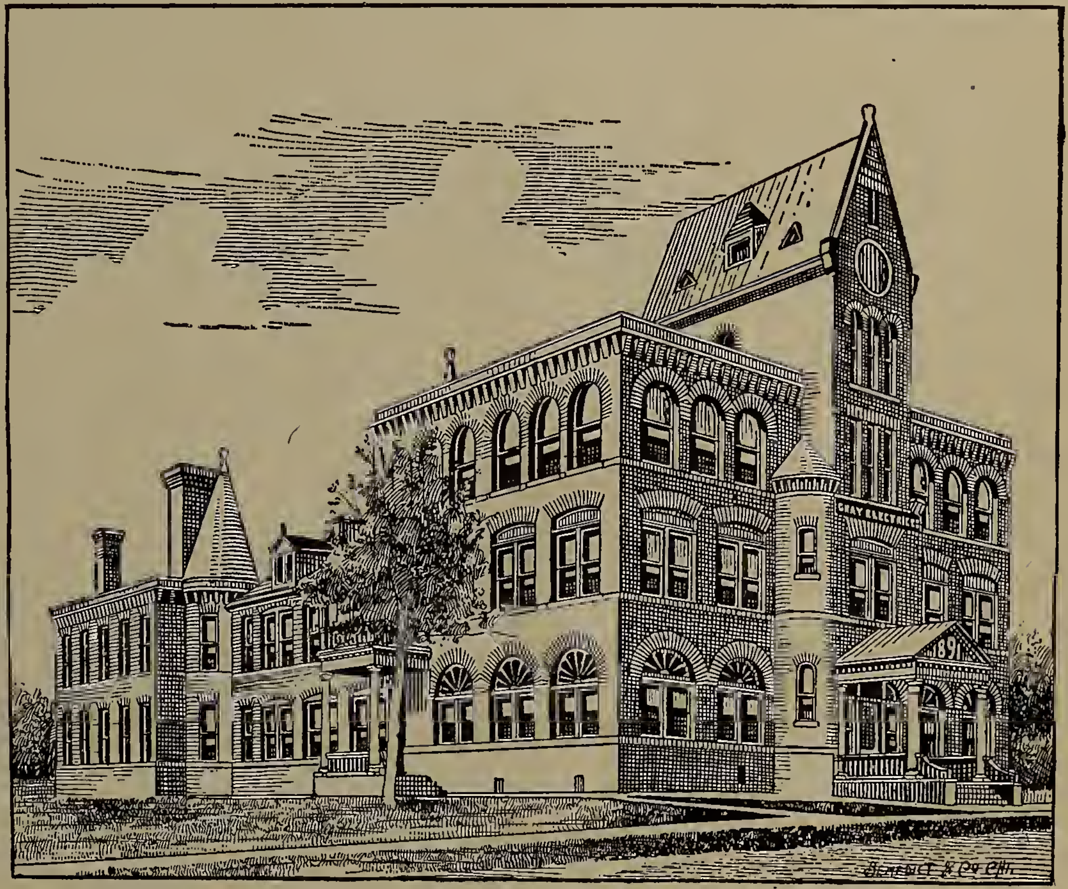
The Telephone—because of frequent mistakes arising from the similarity of articulate sounds as heard through it—is but little used in transmitting messages to and from the telegraph offices. By means of the Telautograph, this service may be quickly and correctly performed without the intervention of the messenger boy.

Railroad companies can use these instruments on their own lines, without the services of telegraph operators. Much of the telegraphic business of a railroad company is done by its freight department; and, with the Telautograph, car numbers, rates, and tracers can be accurately sent. And so, a train dispatcher can have train orders delivered to conductors and engineers in his own handwriting and receive their acknowledgments in like manner, thus minimizing the danger of errors.

The Telautograph will, it is claimed, monopolize the private line business of the country. Requiring no operator at either end of the line, it will stand without a rival in this department of electrical communication.

It will prove invaluable for quick and correct reports of races, base ball games and other sports.

In cities and towns the Telautograph will be operated on the Exchange or Central Station plan, in much the same manner as the telephone is now worked.



GRAY ELECTRIC COMPANY'S FACTORY, HIGHLAND PARK, ILLS.

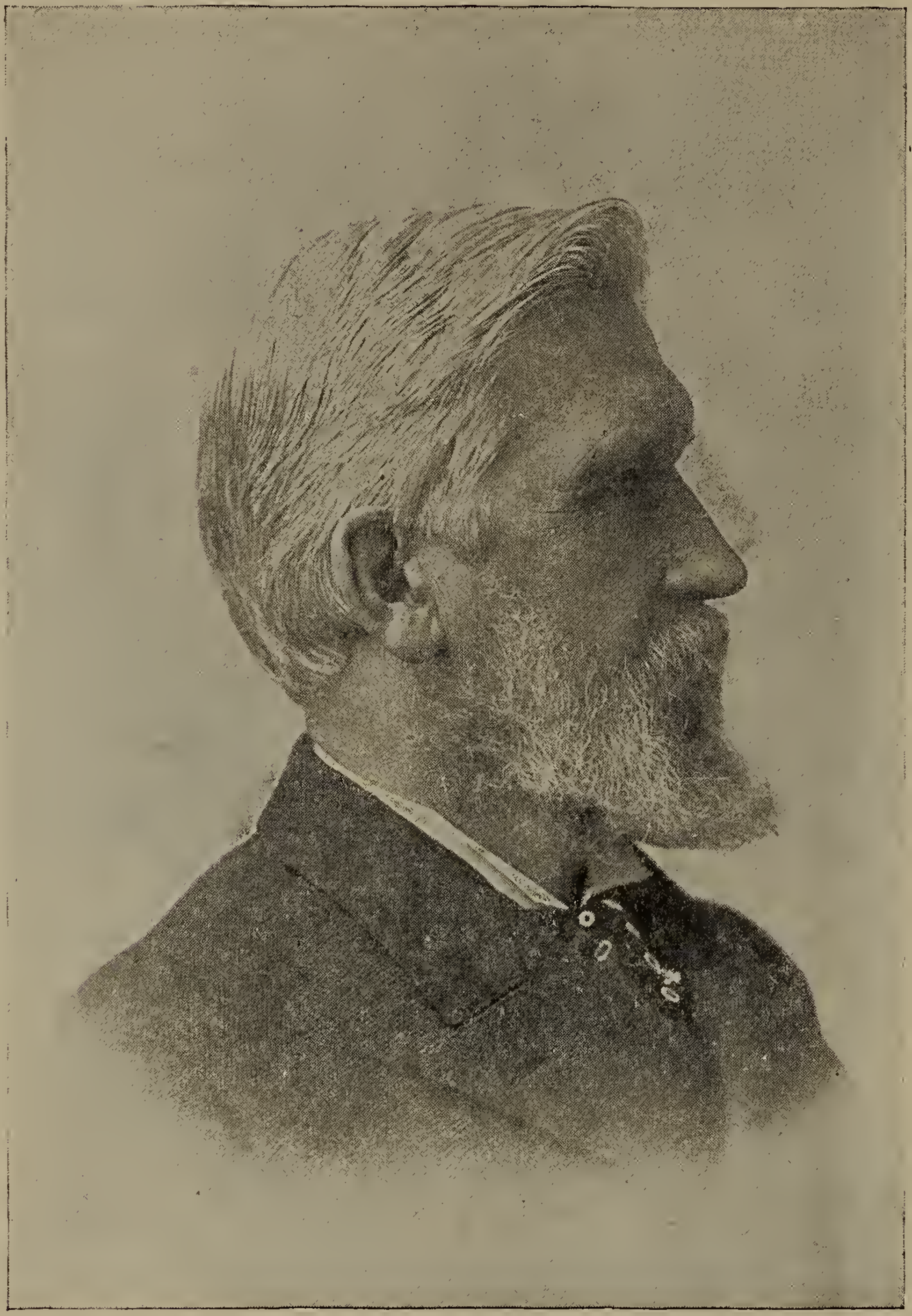
Among the advantages claimed for the Telautograph the following may be particularly pointed out:

1. Any person accustomed to writing can use the Telautograph.
2. Whatever is written at one end of the circuit is reproduced in fac-simile at the other.
3. Arbitrary signs, pictures, diagrams, figures, tabulated statements, cipher and shorthand signals, are transmitted, as well as ordinary handwriting.
4. The sender and receiver each has a record of every message and reply.
5. If the receiver is absent, he will find the message on his return.
6. The Telautograph works noiselessly, and ensures secret service.
7. It is so simple as to be easily kept in order.
8. Its operations are not affected by induction or leakage.
9. The line cannot be so tapped as to intercept or steal a message.

All the rights in the Telautograph for the United States and its Territories, covering patents issued and to be issued, and future improvements, have been assigned by Professor Gray to the Gray National Telautograph Company, a corporation chartered and organized under the laws of the State of Virginia.

The main office of this company is at No. 80 Broadway, New York. Its officers are as follows: T. M. Logan, President; Jno. W. Johnston, General Manager; W. H. Eckert, General Superintendent; and Jos. E. Cox, Secretary.

The Gray Electric Company, under its contract with this company, has constructed at Highland Park, Ill., a factory especially adapted and equipped for the manufacture of the Telautograph and necessary appliances. An illustration of the factory is given herewith.



PROF. ELISHA GRAY.

IMPORTANT PATENT DECISION.

The United States Supreme Court, on March 27th, rendered a decision which it is said will have a very important bearing on certain electrical patents. The decision was rendered in a suit over a patent, brought by Henry Huber against the Nelson Manufacturing Company.

A patent upon the invention in question was granted in Great Britain, April 7, 1874, to run fourteen years, with the proviso that if a stamp duty of £100 were not paid within seven years the patent should expire at the end of seven years. The duty was not paid and the patent became void in Great Britain, April 7, 1881. The patentee, having assigned to James E. Boyle, application was made under the assignment for a patent in the United States on November 29, 1881, and a patent was granted June 27, 1882. Boyle then assigned to Huber. The courts below held that the patent is void because it was granted after the British patent ceased to exist and this decision is affirmed by the United States Supreme Court.

The patent office officials assert that this decision will similarly affect Edison's quadruplex telegraph patent, and also his three microphone patents. As regards the microphone patents it is stated that after January 30th next, the Bell telephone monopoly will rest entirely on the Berliner patent, which is now the subject of the complaint filed by the Attorney-General on February 9th last. In this the Attorney-General asks for the annulment of the Berliner patent. The facts in the case were published in the Electrical Age of February 18, last.

Argument postponed—The argument in the suit of the General Electric Company against the Columbia Lamp Company of St. Louis has been postponed until April 10, at the request of the General Electric Company.

Mr. J. H. Rhotehamel of the Columbia Lamp Co., St. Louis, is in town.

THE PRESENT AND FUTURE COMPETITION BETWEEN GAS AND ELECTRICITY.*

BY JOSEPH GWYNN, STEUBENVILLE, OHIO.

The above subject was assigned me by the Executive Committee of the Ohio Gas Light Association, and at the urgent request of our worthy Secretary I consented against my own judgment, to prepare a paper on the subject. My reasons for objecting were that I did not consider it a proper subject to come before a strictly gas association, and last, but not least, my grave doubts as to my ability to add anything to what has already been written in papers read before this Association some years ago. I feel confident that the subject as treated will not please what is termed strictly a gas man, as his whole heart, soul and energy, if he is a wide awake gas manager, are bent upon his gas business; and as most of you are aware, everything in the illuminating line is inferior, unreliable and impracticable as compared with gas, that is, looking at it from his standpoint. But none the less, electricity is in our midst and with its rapid strides is advancing with unparalleled rapidity in all directions. Never in the history of the civilized world, has any one invention or discovery made the rapid strides and advancement that has electricity. It has been and is being daily pushed by unlimited capital and energy. As I stated at our Dayton meeting several years ago, electricity has come to stay and my advice to all live gas managers, is not to follow in the footsteps of Rip Van Winkle, but to wake up and take hold at the helm and be at your posts ready to meet all emergencies as they come, and be in shape to give the public whatever kind of light they demand. That electricity is a full fledged competitor of gas in all that the word implies, I think there can be no doubt. It has, practically speaking, an unlimited field to fill and more opportunity for rapid strides and advancement than has gas; and while it has some disadvantages to gas, looking at it from an illuminating standpoint, yet on the other hand, it has some advantages over gas.

In order to get at the inwardness of both branches of the industries and to treat them fairly from an unbiased standpoint and produce a paper based on actual facts and figures, and not one written from my own views on the subject, I communicated with upwards of two hundred gas and electric companies in different parts of the United States, in order to obtain as reliable data as possible on the subject to be treated.

(*To be continued.*)

COST OF STEAM POWER.

At the seventy-fifth meeting of the American Institute of Electrical Engineers, held at headquarters, March 21, Chas. E. Emery, Ph. D., read a very elaborate paper entitled "The cost of steam power produced with engines of different types under practical conditions; with supplement relating to water power."

In it Dr. Emery examined all the principal causes which affect the cost of steam power in engines of different types operated under practical conditions. The substantial equalization of the cost of the power developed with engines of different types and different degrees of economy, when expenses independent of the coal consumed are considered, formed a very prominent feature of the discussion. It was shown that such additional expenses are fairly constant, independent of the type of engine, and that without considering interest or dividends they will in some case equal the cost of coal.

Table I., which accompanies the paper, shows in detail the cost of one-horse power per year developed in engines of different kinds, when operated for 10 hours per day for 308 days in the year, and for 20 hours per day for every day in the year, with columns showing the results in each case for coal costing $2, $3, $4 and $5 per ton. The results are at first presented on the basis that the power required is comparatively steady so that no surplus machinery is required. A second presentation shows the result for electric light and other plants in case 50% surplus machinery be provided to supply the maximum power during certain portions of the day, and the power for the remainder of the day is sufficiently low to maintain the average.

Table II. shows the total costs per horse-power per year on the basis of coal at $3 per ton, with and without surplus power, the hours of running in both cases being the same as presented in Table I. It shows that the effect is in favor of the engines requiring the use of most fuel for the evident reason that, as they require more boiler power for a given net power the reduction for them is proportionally greater than for the higher priced engines.

Evidently, however, says Mr. Emery, any decrease found possible in the cost of engines or of the numerous attachments and appurtenances necessary or claimed to be necessary in connection with a steam plant, and which do not increase in cost proportionally to the commercial horse-power, will decrease the interest charges in a higher proportion for the more economical engines and thus secure economy both by saving of fuel and by saving of interest. These considerations, though not governing ones, since interest is only one item of expense, show the desirability of exercising careful judgment in the details of a steam plant. There will be no economy in selecting poor material or in hurrying matters so as to secure cheap work. Everything must be of the best in the sense of being the best adapted for the purpose. The tendency to put in numerous details, each by itself of small cost, needs, however, to be checked, as such items amount in the aggregate to a large sum. It is recommended that the purchase of the various devices which are being urged upon the owners of steam plants should not be consummated unless they will surely save, say, 25 per cent. of their cost annually. It will be observed that the columns of the table foot up a percentage proportioned to more than two-thirds of this, and as the attention and repairs of miscellaneous apparatus is great, the additional percentage is not only thought to be warranted but to be perhaps insufficient in some cases.

The comparison shows the non-condensing engines inferior at every point to condensing engines. Non-condensing engines are wasteful of fuel when heavily loaded on account of low expansion and at light loads the back pressure forms a large proportion of the total resistance, whereas condensing engines will maintain their economy through a wider range on account of the reduction of the back pressure. The back pressure must particularly affect the economy of the new triple compound engines when used non-condensing. It does not seem possible that such engines used non-condensing can for irregular loads show any economy over well designed compound engines operated non-condensing, unless the steam pressure is carried to 200 pounds or upward and the size of the cylinders carefully proportioned to the average load.

Touching the subject of water power, Dr. Emery says:

When the power of a waterfall is to be delivered at a distance, the allowable cost of actually developing the power must be decreased by that necessary to transmit the power and actually deliver it to a jack shaft at a given distance. An electric transmission is undoubtedly the most economical for such a purpose. If we add to the cost of the electric dynamos that of the buildings, of the hydraulic connections to the canals, of the turbines, of the line and of the installation, and finally add the cost of the motors, so that the power is according to the assumption delivered to a jack shaft, the total cost of what may be called the "electrical transmission plant" cannot probably at present prices be put in for $140 for each net horse-power delivered, so on a 10 hour basis no expenditure could be allowed for the general development of the water power, but only for the simplest hydraulic connections to existing canals, etc. If, however, power can be sold througout the whole 24 hours, more than double the price can be obtained for the same, and this will warrant doubling the total cost of development unless a greater percentage of income is desired. As the cost of the electrical plant remains the same, the whole allowable increase may be applied to the development of the hydraulic plant, thereby entirely changing the conditions.

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* Paper read at meeting of Ohio Gas Light Association, Columbus March 15 and 16, 1893.

The writer has not hesitated to recommend an original expenditure of $200 per horse-power for a combined hydraulic and electric plant near large cities, where not only the customary income due to incandescent and arc lighting and the use of small motors at high rates would be available for comparatively short hours, but where the industries were such that large units of power could be sold at remunerative prices on a 24 hour basis. Even higher costs for development would appear to be warranted in some locations, but there is no general rule on the subject. The allowable expenditure in a particular case can only be determined from calculations based on the actual conditions.

LONG DISTANCE TRANSMISSION OF POWER BY DIRECT CURRENTS.

Mr. Frank Kitton made a few remarks on the title subject before the Buffalo Electrical Society.

He stated that the use of direct currents had not lately received the same attention as alternating currents for transmitting power, probably because it was thought by many that they could not be utilized with the same degree of economy in covering great distances; that perhaps the greatest difficulties, in this respect, appear when considered from a standpoint of constant potential transmission; when such factors as "pressure," "size of conductor" and "loss" appear to "whipsaw" with each other and that it had not appeared practicable to transmit a large amount of power, to a considerable distance, with a satisfactory degree of economy by means of direct current at a constant potential; while on the other hand more or less success has been obtained with power transmission by direct currents on a constant current system, such systems being, apparently, in successful operation at home and abroad. It was understood that the proposition to transmit power to the World's Fair at Chicago, obtained from the falls of Niagara, was based on such a constant current transmission.

Mention was made of a constant potential transmission recently patented by Mr. Chas. S. Bradley, which presented some novel features that, it is claimed, will obviate the difficulties referred to.

Mr. Bradley proposed to obtain a sufficiently high voltage for his purpose by connecting a number of generators, of comparatively low potential, in series, thus overcoming the difficulties experienced in constructing commutators, and securing insulation in armatures, which under ordinary conditions will not withstand the excessively high voltage necessary, and at the receiving and placing an equal number of motors in series, for reconversion of the electrical energy into mechanical motion.

It is said that this system "involves features for rendering the operation safe, both for the machines themselves and for the operators who attend them"; that "such an invention brings the direct current machine, which has a very high efficiency, into the field of long distance transmission of power. Heretofore such machines have been limited to power transmission over short distances," and "is designed to render practicable the development of a direct current of high potential and its reconversion into power at the end of a transmitting line."

One of the novelties of the system appeared to be the use of series connected generators in a constant potential system of transmission. The question naturally arises, what are the advantages to be derived from transmitting power by such a system under constant pressure that are not already secured in a somewhat similar arrangement of generators for maintaining a constant current, with an equally high pressure, but which varies with the load?

A lengthy discussion followed, bringing out some interesting facts.

Mr. Frank C. Perkins, who has recently returned from abroad, where he had obtained much information on the subject, said:

"I do not see the novelty of the invention of Mr. Bradley, for the reason that in looking up the principal central stations for transmission of power in Austria, Switzerland, France, Germany and Italy, many different systems were found to be in use with varying success, and a station at Genoa, Italy, was among the most interesting, as it was operated by almost exactly the same arrangement as indicated by Mr. Bradley. The electromotive force used was 8,000 volts, a direct current being used for the transmission. The system is that of R. Thury, electrician of Cuenod, Sautter & Company, Geneva, Switzerland, and is on the same general principle as the plans they submitted for transmission of power by electricity from Niagara to Buffalo, at the request of the Niagara commission. These plans took the highest prize awarded at that time, undoubtedly because the three-phase alternating system had not at that time been so thoroughly investigated.

The total distance of transmission at Genoa is 26 kilometres. The company operating the station is "The Societa Acquedotto Defewari Gallaiera," with a capital of 5,000,000 francs. The power obtained is from a small stream in the mountains near Isoverda and Pontedicemo. The total fall is 450 metres, and there are three stations built up the mountain side, each having a fall of 150 metres, the same water being used three times. The highest station is called Paccinotti, the second Volta, and the third Galvani. From each station there are two conductors running to Genoa, Italy, making three distinct motor circuits, each carrying from 4,000 to 8,000 volts, according to load. The motors are all connected in series and vary from 6 to 60 horse-power; a constant current being used of 44 amperes, and a variable voltage of from 50 to 1,150 volts for each motor according to size. The current in line is constant, and the pressure varies with the load. Each station has five turbines of 140 horse-power The speed of each turbine is 475 revolutions per minute. To each turbine two Thury dynamos are directly coupled, having a capacity of 70 horse-power each, with a normal potential of 1,050 volts. The turbines were constructed by Faesch & Piccord, of Geneva, Switzerland—the firm whose plans for the Niagara plant took the highest prize for turbines, given by the Niagara Commission. There are two pipes conducting the water to the turbines for each station, averaging about 250 metres in length and half a metre in diameter. One of the turbines and two dynamos are held in reserve for use in an emergency.

These generators are all connected in series, making a total pressure on the line of something over 8,000 volts when the eight machines are running. The line consists of two copper wires 9 millimetres in diameter, and each 26 kilometres long; at a careful test made on a rainy day the loss on the 52 kilometres of line was less than one one-hundredth of one per cent., the electromotive force at the time of the test being 4,000 volts.

The governor used is an electric one of Mr. Thury's design. The direct current machines of 150 amperes and 100 volts each, are connected directly to a turbine of 15 horse-power. One of the dynamos is held in reserve and the other used for regulating the field of the other dynamos. When a large electric motor is thrown out of use in the city of Genoa, the electric governor slows down the small water motor by an electric valve, and the exciter then furnishes less current to the field of the large generators, so that the potential of the line is reduced in proportion to the number of motors thrown out of the circuit. The regulator works very nicely, as was seen at the station Volta while in operation. The generators have a guaranteed efficiency of 92 per cent., and the motors over 30 horse-power are stated also to have an efficiency of 92 per cent., while the motors below 30 horse-power are stated to have an efficiency of 88 per cent.

The motors in the city of Genoa are directly connected to incandescent low potential machines and arc machines for distribution throughout the city.

PERSONAL.

Dr. F. A. C. Perrine has resigned his position as Treasurer of the Germania Electric Co., of Boston, to accept the appointment as Professor of Electrical Engineering at the Leland Stanford, Jr., University, Palo Alto, Cal. He will assume his new duties about August 1 next, and his many friends will be pleased to know of his success. He is abundantly capable of filling the new position with honor to himself and the institution.

Mr. Daniel F. Lewis, President of the Brooklyn City Railway Company, Brooklyn, N. Y., was married a few days ago to a young lady of Plainfield, N. J. The ceremony was strictly private.

Mr. Allen H. Moore, of Danville, Ill., has been solicited to take charge of the proposed factory of the Thomson-Houston Electric Light Co. in Berlin, Ill.

OBITUARY.

We regret to announce the death of Mr. Samuel Boardman, President of the Bishop Gutta Percha Company, of New York City, at the age of about 77 years. Mr. Boardman was an Englishman by birth, having been born in Manchester. He came to New York in 1832. He organized the Bishop Gutta Percha Company in 1885.

Mr. Boardman was also the senior member of the law firm of Boardman & Boardman, of New York. His home was in Newark, N. J., where he died on March 14.

TELEGRAPHIC TOURNAMENT.

The National Fast Telegraphic Tournament under the auspices of the Telegraphers' Mutual Relief Association Fund, took place in Hardman Hall, New York City, in the afternoon and evening of March 25.

The following is a summary of the six events:

First event—ladies class; 500 words to be sent. First prize $50; second $25, for receiving; first prize $25; second $15, for sending. The winning senders were S. E. Sandberg, first prize; time 11 m. 7 secs.; Louise Wagner, second; time 13 m. 12 sec. Receivers: M. L. C. White, first; S. E. Sandberg, second. The matter was received on typewriters, the same being done in all the other events.

Second event—John W. Mackay, Message class. Wm. Gibson to send messages for one hour; first prize, gold medal valued at $150; second prize, gold medal valued at $100.

Mr. Gibson transmitted 94 messages in one hour. The prizes were awarded as follows: First, B. S. Durkee; second, J. F. Parks.

Third event—Open to all except to those who may have sent more than 235 words in five minutes in a previous tournament. First prize for sending, $100; second, $75; first prize for receiving, $100; second, $75. Winning senders, E. D. Moore, first, R. C. Mecredy, second. Receivers, C. L. Hayes, first, H. B. Logan, second.

Fourth event—Open to all except those who may have sent more than 230 words in five minutes in a previous tournament. First prize for receiving $100; second, $75; first prize for sending $100; second, $75. Winners, receivers, E. H. Curlette, first; J. H. Jones, second. The Caligraph people offered a nickel plated caligraph as third prize, which was won by P. J. Faulkner.

Fifth event—W. P. Phillips' Code class. Sending, first prize $100; second $75. Receiving, first prize, $100; second, $75. Winning senders, C. B. Squires, first, E. H. Curlette, second. Receiving winners, C. L. Hayes, first; second divided between H. B. Logan and G. P. Howe.

Sixth event—For the championship of the world. Sending, first prize $100 and championship medal, second $75; receiving, first prize $100 and championship medal, second $75. The sending prize was given by W. P. Phillips and the receiving prize by the Postal Telegraph Company. Winners, senders, F. J. Kihm first, F. L. Catlin second. Receiver's, H. B. Logan, first; J. M. Winder, second.

Great enthusiasm attended the various events, and the attendance was very large. The affair was a very great success, and the work done was phenomenal. The winning receiver in the message class, Mr. Durkie, is from Portland, Ore., and is employed by the Postal Telegraph Company. The winner of the second prize is employed by the same company at San Francisco.

TELEPHONE RATES.

At a public meeting of the New York Mercantile Exchange, held on March 22, resolutions were adopted in favor of the passage of Senator Walker's bill by the New York legislature, providing for a reduction in the telephone rates. The following is a copy of the preamble and resolutions:

Whereas, for years the Bell Telephone Company has enjoyed the privilege of a public monopoly in this State under the patent laws of the United States, free from any interference on the part of the State, and has used the power conferred and the privilege granted to oppress the business community and those who have been compelled to employ the telephone, by exacting exorbitant rates for an inferior service without any consideration for the public interests; and

Whereas, this giant monopoly, notwithstanding its original patent has now expired, still proposes to perpetuate its power and continue its exactions by trick and device inimical to the public welfare and at variance with recognized business principles which should obtain with it in its dealings with those who employ the service; and

Wheras, it is clearly the duty of the legislature to fix a just and equitable rate to govern telephone charges in the State, so that a monopoly may not impose a burdensome tax upon thousands of subscribers and interfere with the extended use of the telephone by other thousands; therefore be it

Resolved, That the New York Mercantile Exchange earnestly urges upon the legislature the necessity of taking prompt and vigorous action in pressing the necessary legislation demanded by the people and voiced by business organizations and the press to regulate telephone charges, and they recommend as a measure calculated to accomplish the purpose sought the enactment of Senate bill No. 499, introduced by Senator Walker.

Resolved, That a copy of this resolution be sent to each of the honorable legislators of this State, to each of the several Exchanges in New York city, and to each of the daily papers published in the cities of New York and Brooklyn.

MASSACHUSETTS ELECTRIC LIGHT COMMISSION REPORT.

Through the courtesy of Mr. F. E. Barker, of Boston, member of the Massachusetts Board of Gas and Electric Light Commissioners, we have received an advance copy of the Eighth Annual Report of the Commission. It is a very complete exposition of the gas and electric light industries in that State, and from it we glean a few facts of general interest. The number of companies in active operation in the State, on June 30, last, was 84. The total receipts of the electric light central stations, during the year ending June 30, 1892, were $2,970,637.94, against $2,440,350.65 the previous year. The expenses during the same periods were $2,015,402.86 and $1,735,206,13, respectively, leaving a balance in favor of 1892 of $955,235.08, and of $705,144.52 for 1891.

The assets of electric companies only show a total, for 1892, of $12,438,857.19, and for the preceding year $9,931,887.66. Liabilities for the same periods, respectively, $11,791,890.24 and $9,457,061.11. The surplus for 1892 was equivalent to $9\frac{8}{10}$ per cent. on the capital, against 9 per cent. the previous year. Out of 56 companies, 23 declared dividends aggregating $323,581, and the balance declared none.

The dynamo capacity on June 30, 1892, represented by electric lights of various candle power, was, in 1892, 235,618 against 205,974 in 1891.

An interesting statement is given showing the number of public lamps, their candle power, the average number of hours burnt per night, the number of nights per month and the price paid. In Amherst, the public lights are furnished free for the privilege of occupying the streets. A very complete statement is also made of the price charged by the several electric light companies for commercial lights.

The report contains 126 pages, without the appendices, and furnishes a great abundance of food for thought and calculation. It is one of the most complete and interesting reports that we have ever seen.

TELEGRAPH DEPARTMENT.

Mr. C. S. Jones, Superintendent of Telegraph of the Illinois Central Railroad Company's lines north of Cairo, Ill., is dead. The vacancy thus created has been filled by the extension of the jurisdiction of Mr. G. M. Dugan, Superintendent of Telegraph south of Cairo. Mr. Dugan is now Superintendent of the entire Illinois Central's telegraph system, with headquarters at Chicago. Mr C. F. Annett has been appointed Mr. Dugan's assistant with headquarters at Chicago. Mr. Jones was a prominent member of the Association of Railway Telegraph Superintendents, and held the presidency of the Association during 1892.

The Municipal Telegraph Company was incorporated at Albany, N. Y., on March 17, with a capital of $100,000. The points to be connected and the route of the lines are as follows: From Albany to New York, there to connect with the principal places in Westchester and Kings counties; to the cities and towns of Erie and Saratoga counties, and other cities and towns in New York State. Beyond the limits of this State the line will be operated from Albany to the principal cities and towns in New Jersey; to Chicago, to Louisville, Lexington, and Covington, Ky.; to Nashville and Memphis Tenn.; to New Orleans, to St. Louis, Baltimore, Washington and Montreal. The directors are John Mack, James L. Holland, William Lane, John Graham, and Patrick H. Mack, of Albany, John S Campbell of New York city, and James H. Ryan of Troy. It is said that the majority of the incorporators are interested in Albany pool rooms.

Recently Madras and Bombay (India) were connected directly by telegraph and messages were exchanged between the two places by duplex. The distance between the cities is 2,100 miles, and copper wire is employed on the line. This circuit is to be a permanent one.

The report comes from London that the Commercial Cable Company will at once lay a third cable between Nova Scotia and Ireland.

CLEVELAND NOTES.

Epworth Memorial Methodist Episcopal Church, corner Willson avenue and Prospect street, which is now nearing completion, will be brilliantly lighted by electric light. One hundred and fifty-two incandescent lights will be set in the elaborate stucco ornamentation of the groined arch ceiling. In addition to these lights there will be a centre reflecting chandelier, six feet in diameter, containing sixty incandescent lights.

On March 15 the switchboard at H. R. Jacob's theatre was burned out by a heavily charged wire igniting the rubber insulation. The electrical inspector of the Board of Underwriters had pronounced the switchboard safe. The City electrician does not consider rubber insulation safe.

F. E. Homer & Co., electrical machinists, 46 South Water street, are doing well in their specialty of manufacturing and refilling commutators. Mr. F. E. Homer has been engaged in this particular branch of the business for a number of years and is thoroughly conversant with all its details. In addition to this work the firm also makes a specialty of dynamo and motor repairing. The firm was established November 1, 1892. In the manufacture of commutators this firm uses tempered copper and mica insulation. They exercise the greatest of care in the construction of commutators and they always get a perfectly true circumference.

Mr. Crossley of the Crossley Car Brake Company, Cleveland, is in high spirits over the success of his brake. The company is fitting a large number of cars on electric and cable roads with the Crossley brake and has large orders for them from Pittsburg, Cincinnati and Chicago roads. A contract has been made with the Risdon Iron Works, San Francisco, Cal., whereby the latter company will manufacture and sell the brakes on royalty in California. The Crossley Company recently shipped several of the brakes to San Francisco to fill immediate orders.

I. H. Moses, the well-known electrical contractor and supply man, 30 South Water street, is jubilant over his successful business last year; he says it actually quadrupled. He employs a large number of incandescent light wiremen and he makes isolated plant work a specialty. He is now just completing the wiring of the press-rooms, offices and composing room of the *Penny Press* of this city, for 200 lights. He also wired the *World's* establishment for 150 lights and is now engaged in wiring the Kennard House for 500 incandescent lights and a 140-number return-call annunciator. The frame of this annunciator is a handsome piece of work, being made of antique oak. A 6-number annunciator is also being put in the Kennard for the elevator service. Among the out-of-town contracts is one of 500 lights in the Beebe House, Elyria, Ohio, the wiring for which he is now engaged on. The contract also includes a 120-number return-call annunciator. Mr. Moses' stock is a large and varied one ranging from the common push button to the handsomely finished large mechanical gong; incandescent supplies, house, office and factory apparatus and material of all kinds. He also carries a full line of safety insulated wires and cables. He has the contract for fitting out 22 steamboats of the Menominee and Globe Steamboat Company of Cleveland.

I STOPPED in to see the Ohio Construction Co. the other day not thinking of running down one of the old stagers in the electric light business. If anyone is anxious to know whether the ten weeks' old Ohio Construction Company is to meet with exceptional success the best affirmative answer is that Mr. Howard L. Browning is general manager. The writer recalls when the little band of Edison men were straining under the old Edison Isolated Company at 65 Fifth avenue, New York City to convince people that the current wouldn't kill. These were in the days when, if one of the "boys" at "65" sold a plant it was celebrated by a general pow wow. Mr. Browning was at this time the assistant New York City agent; later on he became the New York State agent, and after partner in the firm of Hughes & Browning, agents for New York, Rhode Island and Connecticut. Mr. Browning sold in the city in early days plants to the American Express Company, Williamsburgh City Fire Ins. Co., Dakota Flats, Young Women's Christian Association, Murray Hill Hotel and others. These are among the oldest electric plants in the country. When up in the State no light except an Edison was sold within miles of Mr. Browning's office in Albany. The firm organized the Edison Light and Power Co. of Albany and installed its plant. They also organized and put in the plant of the Edison Light and Power Company of Troy, N. Y., the Edison Illuminating Company of Rochester, N. Y., and the Cooperstown Electric Light and Power Co. Among the very many isolated plants sold by them was that of the Herkimer paper mills, Herkimer, N. Y.; Power's Hotel, Rochester; Ames Vacuum Air Brake Co., Watertown; Weed & Parsons, Y. M. C. A., Albany Paper Co., Daily Press., etc. of Albany. The writer remembers all this early struggle well and he remembers, too, how enthusiastic an Edison man Mr. Browning was. In his talk the other day with Mr. Browning he thought that he detected a little sadness in the tone of reference to the new combine, but the same enthusiasm came out when the names of his early comrades were mentioned. The name that makes Mr. Browning still prick up his ears is that of Edward H. Johnson, the man who, he says, made the Edison interests what they are, and the man of men when it comes to heart and honor—Mr. Browning's hero. Under Mr. Browning's charge the Ohio Construction Company has already met with excellent success. It has contracted for the Northern Ohio Blanket Mills, the Newark and Granville St. Ry. Co., Kinne & Levans china warehouses in Cleveland, the Baakes Wire and Nail Co.'s plant in Cleveland and others about the State. Mr. Browning has good men back of him and there is no doubt that the Ohio Construction Company will do good work—Railroad, Light or Power. It is a pleasure to find one so loyal to his old comrades as Mr. Browning is.

THE UNIVERSAL ELECTRIC COMPANY, 739–741 Cedar ave., reports a good trade and excellent prospects for the future. Mr. A. L. Daniels, well known in the electrical trade is now connected with this company. The officers of the company are: M. S. Possons, President and Manager; Geo. R. Lean, Vice-President and Superintendent; W. J. Possons, Secretary and Treasurer. The Universal Electric Company is making a full line of tempered copper commutator sections for dynamos and motors, also other parts of this class of machines. The company carries on a general electrical business, and does a large trade in the repairing of incandescent lamps.

On a visit to the works of the Walker Mfg. Co. I learned that this company has completed the cable machinery for the power house of the Broadway Cable road, cor. Broadway and Houston street, and for the Third Avenue road power house, New York City. The machinery for the Broadway power house includes four pulleys 32 feet in diameter and eight feet four inches width of face. They are rope transmission pulleys, and each will have 34 ropes. These enormous pulleys weigh 104 tons each. Machinery for the East Baltimore street power house of the Baltimore City Passenger Railway is now being shipped. The Walker Co. is just completing cable machinery for the Blue Island Avenue power house, Chicago, and has just closed a contract with the Denver City Cable Street Railway Co. for additional rope driving machinery. New cast steel gears are being made to take the place of the old gears. The Walker Mfg. Co. makes a full line of boiler-shop equipment, besides hydraulic power presses used in the manufacture of street car trucks, and hydraulic presses for stamping, shearing, riveting, etc., in boiler making. The company is building two 2,000 tons steam-hydro cotton presses, the steam cylinders of which are 5 feet 4 inch bore.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
FIRST FLOOR, WORLD BUILDING,
NEW YORK, March 25, 1893.

THE GENERAL ELECTRIC LAUNCH CO., 44 Broad street, city, has just issued a neat catalogue and price-list of electric launches.

THE Subway Commissioners on March 15, revoked a permit given to the Manhattan Electric Light Company, to erect poles on Madison avenue, for the purpose of supplying that thoroughfare with electric light. This action was taken on account of the character of the poles used, objection having being made to the use of the common wooden poles.

MR. S. F. B. MORSE, of the firm of Cushing & Morse, Chicago agents for Kerite wires, was in town this week.

WILLIAM JOHNSON, aged 33, and Maurice Kelly, aged 24, were arrested on March 22, charged with stealing vises and pliers from the factory of the Western Electric Company, on Greenwich street. They were held in $1,000 bail each. It is said they stole goods to the value of $150 or $200.

ON March 22, application was made to the Brooklyn City council by a new telephone company for the right to string wires thoroughout the city. The company guarantees to rent telephones for $65 a year. Mr. Thomas Harkins is president.

W. T. H.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Buffalo, N. Y.—Bronner Bros., clothiers, boot and shoe dealers, Main Street, are making extensive alterations in their building and intend to instal a complete electric plant in the near future.

Guilford, Conn.—An electric light plant is to be established in this town.

Jefferson, Wis.—An electric plant is to be installed by this town.

Lawrence Junction, Pa.—This place is to be lighted by electricity.

Newmarket, N. H.—There is talk here in favor of the establishing of an electric light plant.

St. Clair, Mich.—Bids will be received for the installation of an electric light plant in this city of one thousand lights (alternating system) and fifty arc lights. Address Mr. P. S. Carleton, Chairman Electric Light Commission, this city.

Wallkill, N. Y.—There is talk of establishing a municipal electric light plant.

NEW CORPORATIONS.

Chicago, Ill.—The Chicago Electric Headlight Company; capital $200,000; incorporators, John T. Van Smith, Arthur Horton and Clarendo B. Eyer.

Newark, N. J.—The New Jersey Light and Heat Company was incorporated on March 23. The incorporators are George R. Gray, State Treasurer; Emerson McMillan, Columbus, Ohio, and Henry B. Wilson of New York City. It is reported that John Kean, jr., of Elizabeth, and Henry S. Little of Trenton, are interested.

Peoria, Ill.—The Spring Valley Electric Light Company, capital, $25,000; incorporators, E. B. Hillman, H. T. Hays and L. B. Bradley.

The Wyoming Electric Light and Power Company, capital, $15,000; incorporators, E. B. Hillman, H. T. Hays and L. B. Bradley.

Portland, Me.—The Davis Electric Works, capital $200,000. Leonard L. Davis of Springfield, Mass., is president and treasurer.

South Milwaukee, Wis.—The South Milwaukee Light and Power Company, capital, $15,000; incorporators, Frank H. Brice, William M. Williams and A. W. Bell.

Columbus, O.—The Columbus Central Railroad Company, has been organized by Cleveland and New York capitalists. Capital stock, $1,500,000. The company proposes to construct a road in the city running to suburban towns.

Concord, N. H.—The Kearsarge Electric Railway Company has been incorporated.

Danielsonville, Conn.—The petition for the incorporation of the People's Light and Power Company in this place has been favorably acted upon.

East St. Louis, Ill.—The Columbian Electric Underground Tramway Company, Capital, $1,000,000. Incorporators: Stephen Von Phul, George L. Deeke and Daniel J. Murnane.

Hoboken, N. J.—The Hudson and Bergen Traction Co. has been incorporated with a capital of $5,000,000. The company will, it is said, absorb the North Hudson Railway Company and construct 36 different extensions.

Jersey City, N. J.—The Consolidated Traction Company has been incorporated and on March 17, elected the following named officers: E. F. C. Young, president; Thomas J. George of Newark, secretary and treasurer; David Young of Newark, chief engineer.

Kittery, Me.—The Kittery and York Electric Railroad Company has applied for incorporation.

Litchfield, Conn.—W. T. Marsh and others have petitioned for an electric light and power charter.

Mt. Vernon, O.—The Mt. Vernon Electric Light and Street Railway Company, with a capital of $400,000 has been organized. It proposes to light the city and build an electric road to Gambier.

Peru, Ind.—The Peru Railway Co. has been granted a franchise to build and operate a street railway in this city. The officers of the company are, R. A. Edwards, president; S. C. Mercer, vice-president; R. H. Bougstog, secretary.

Royersford, Pa.—The Royersford and Spring City Street Railway Company. Incorporators: G. Mortimer Lewis, Wilkesbarre; Harry M. Brownback, Norristown; C. J. Lewis, Philadelphia; H. G. Kulp, Pottstown; E. L. Hallman, Royersford and William Albright, Spring City.

Springfield, Ill.—Springfield, Jackson & Winchester Electric Railway Co. Capital, $3,000,000.

Stratford, Conn.—The petition for the incorporation of the Stratford Electric Light Co. has been favorably acted upon.

Wellston, O.—The Wellston Belt and Street Railway Company. Capital $10,000

St. Paul, Minn.—The Brainerd Electric Railway Company. Capital $75,000. Incorporators, C. H. Parker, of St. Paul; R. W. Jones, Minneapolis; and Fred S. Parker, Brainerd.

NEW ROADS.

Cleveland, O.—The Ford-Washburn Storelectro Company has petitioned for the right to construct a double track street railway in Willson avenue, from the lake to Woodland avenue.

Chicago, Ill.—Application has been made for an ordinance giving the right for the construction of the Englewood and Chicago Electric Street Railway Company.

A franchise has been asked for the Chicago and Southwestern Electric Company. This line is to be built in the extreme southern part of the city.

Houston, Tex.—A franchise has been granted for an electric road to Harrisburg this State.

Milwaukee, Wis.—The old project to build an electric road between Milwaukee and Chicago has been revived, and it is said all the rights of way have been secured, and work on the line actually begun. Messrs. Henry C. Payne and C. C. Rogers, of Milwaukee, are directly interested in the scheme.

Oxford, Mass.—A franchise has been granted to the State Central Street Railway to operate lines in this place.

Philadelphia, Pa.—It is reported that a syndicate is about to apply for a charter for an electric road between this city and Trenton, N. J. Col. E. de V. Morrell is said to be a leader in the project.

Pittsburg, Pa.—An electric road between Natrona and Parnassus is talked of. The distance is 6½ miles.

TRADE NOTES.

The Massachusetts Electrical Engineering Company, Boston, Mass., in a pamphlet just issued gives a partial list of electrical tests that it is prepared to make. Its testing department has been a success from the start, and accuracy and reliability of tests are fully guaranteed. The company being in no way associated or connected with electrical supply concerns, manufacturers or contractors, is competent to give its clients impartial and unbiassed work. Its equipment, facilities and space have recently been enlarged, and the company solicits for this department electrical testing and allied work of all kinds.

The Ansonia Electric Co., of Chicago, has organized a new department to its business called the "World's Fair Bureau." The object of this move is to enable the company's patrons and friends to secure through it the advantage of the opportunities offered by the World's Fair. This department will be placed in charge of Hon. Geo. B. Shaw, recently elected to Congress. Mr. Shaw is well-known in electrical circles through his former connection with the National Electric Mfg. Co., of Eau Claire, Wis., as its general manager.

A REMARKABLE BATTERY.

The following is a copy of a letter received by the Jerome Kidder Manufacturing Co., 820 Broadway, New York City, which proves the excellence of this company's medical apparatus. It is an extraordinary record and should receive the careful consideration of those contemplating the purchase of an outfit of this character.

506 W. Water St., Elmira, N.Y.,
March 1st, 1893.

Jerome Kidder Manufacturing Co.,
820 Broadway, New York.

Gentlemen :

We will have no other Medical Apparatus but yours in our catalogue. Will you kindly forward the following electros. * * *

A physician a short time since brought one of your Family Apparatus to us for repairs, and he stated to us that it had been in constant use for over twenty years, without the outlay of one cent for repairs.

Hoping you will forward the electros as soon possible, we remain,

Yours very truly,
Beers Brothers,
Electrical Supply Co.

"We wrote," says the Jerome Kidder Manufacturing Co. "and ascertained that the only repair was the platinum plate had become so bent that it rested on the zinc. It was straightened and then the battery worked as good as ever."

The Electrical Age's Illustrated Record of Patents.

Issued March 21, 1893.

493,629. Thermal Cut-Out for Electric Lamps. Hermann Lemp and Merle J. Wightman, Hartford, Conn., assignors to the Schuyler Electric Company, of Connecticut. Filed Aug. 27, 1886.

493,672. Automatic Electric Cut-Out. Francis B. Badt, Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 6, 1889.

493,673. System for Transmitting Electric Currents. Edward Baines, Brooklyn N. Y., assignor to himself and Edward J. Mitchell, same place, and Adolph L. Mitchell, Rockville, N. Y. Filed March 21, 1892.

493,678. Electric Railway-Signal. Jefferson Bradford and James P. Williams, Boston Station, Ky. Filed June 23, 1892.

493,679. Dynamo-Electric Machine and Motor. Harold P. Brown, New York, N. Y. Filed Dec. 10, 1891.

493,695. Conduit Electric Railway. Henry P. Feltrow, Columbus, Ohio, assignor of one-half to Richmond R. Brown, same place. Filed March 4, 1891.

493,704. Listening and Ringing Key for Telephone Switchboards. William M. Goodridge, Highland Park, assignor to the Western Electric Company, Chicago, Ill. Filed July 19, 1890.

493,716. Conduit System for Electric Railways. Elias Hazelton, Lansing, Mich., assignor of one-half to Harley Ingersoll, same place. Filed Feb. 15, 1892.

493,713. Insulator for Trolley-Wires. Merrill H. Hathaway, Springfield, Mass., and John Kelleher, Manchester, N. H.; Adele L. Hathaway, administratrix of said Merrill H. Hathaway, deceased. Filed April 2, 1892.

493,718. Dynamo-Electric Machine. Santa Hellebrandt, Przemysl, Austria, Hungary. Filed May 25, 1892.

493,739. Electric-Arc Lamp. Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed June 30, 1886.

493,745. Dynamo-Electric Machine. Forée Bain, Chicago, Ill. Filed Dec. 21, 1891.

493,754. Electric Connector and Cut-Out. Charles H. Crockett and Chancellor C. Allen, Boston, Mass. Filed April 8, 1892.

493,755. Electric Cut-Out. Charles H. Crockett and Chancellor C. Allen, Boston, Mass. Filed April 8, 1892.

493,777. Electric Clock Striking Mechanism. William Kaisling, Allegheny, Pa. Filed April 4, 1892.

493,789. Trolley for Electric Railways. John F. Saitt, Baldwin, Allegheny county, assignor of two-thirds to Thomas A. Noble, Pittsburg, and Frederick G. Kay, Allegheny, Pa. Filed June 18, 1891.

493,809. Apparatus for Purifying Liquors by Electrolysis. John Becker, Kymulga, Ala. Filed March 12, 1892.

493,817. Secondary Battery. Lars Bristöl, London, England. Filed Aug. 28, 1890. Renewed Feb. 13, 1892. Patented in Sweden April 10, 1888; in Norway, April 11, 1888; in England, July 6, 1888, and in Belgium, Nov. 13, 1889.

493,842. Electric-Lighting System. Samuel W. Rushmore, Brooklyn, N. Y. Filed Feb. 7, 1891.

493,868. Switch for Electric-Light Fixtures. Joseph Hutchinson, New York, N. Y. Filed April 8, 1892.

493,883. Insulating Coupling. Ernest Ballet, Bordeaux, France. Filed Oct. 31, 1892. Patented in France May 7, 1892.

493,907. Telephone. Charles T. Bloomer, New York, N. Y. Filed Nov. 28, 1892.

493,914. Converter System for Railways. Alard du Bois-Reymond, Charlottenburg, assignor to Siemens & Halske, Berlin, Germany. Filed Feb. 3, 1892.

493,918. Electrically-Operated Railway Switch. Powell Evans, Philadelphia, Pa. Filed Dec. 7, 1891.

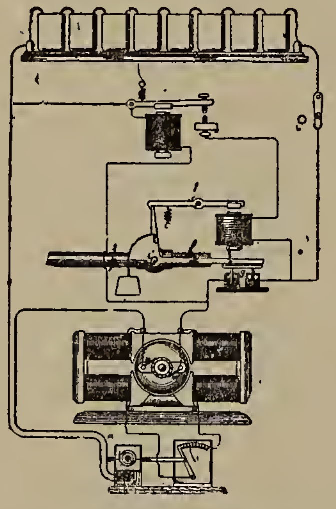
PATENTS.—Continued.

493,926. Lightning-Arrester. Hermann O. Henneberg, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Dec. 9, 1892. Patented in Germany Dec. 8, 1891.

493,935. Electric Railway-Signal. Henry V. Miller, Bloomington, and Alexander C. Miller, Aurora, Ill. Filed Nov. 8, 1892.

493,942. Electric Locomotive. Alexander Philipsborn, Berlin, Germany, assignor to Siemens & Halske, same place. Filed April 21, 1892. Patented in Switzerland May 4, 1891; in Austria-Hungary May 6, 1891; in England May 12, 1891; in France May 15, 1891; in Belgium May 15, 1891, and in Germany Aug. 11, 1891; Oct. 12, 1891, and Feb. 17, 1892.

493,943. Electric Locomotive. Alexander Philipsborn, Berlin, Germany, assignor to Siemens & Halske, same place. Filed May 17, 1892. Patented in Germany May 4, 1890; in Italy Aug. 10, 1890; in France Aug. 11, 1890; in Switzerland Aug. 15, 1890; in Austria-Hungary Aug. 16, 1890; in Belgium Aug. 18, 1890; in Sweden Aug. 18, 1890, and in England Aug. 25, 1890.



493,672—AUTOMATIC ELECTRIC CUT-OUT.

493,948. Closed Conduit for Electric Railways. George W. von Siemens, Berlin, Germany, assignor to Siemens & Halske, same place. Filed June 24, 1892.

493,969. Electric car. Charles Brown, Basle, Switzerland, assignor to the Maschinenbau Gesellschaft, same place. Filed March 8, 1892. Patented in France June 19, 1891, and in Belgium August, 29, 1891.

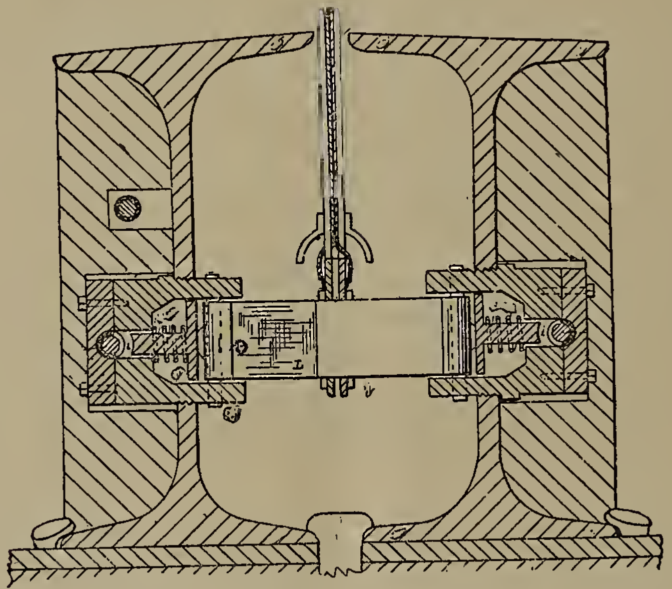
493,997. Electrical Attachment for Rocking-Chairs. Charles E. Hartelius, Bayridge, N. Y. Filed Nov. 22, 1892.

494,007. Block-Signal System. John La Burt, New York, N. Y., assignor, by direct and mesne assignments, to the La Burt Automatic Electrical Block Signal System and Car Coupler Company, same place. Filed June 16, 1892.

494,042. System of Winding Armatures for Dynamo-Electric Machines. William M. Thomas, Grand Rapids, assignor to Louis Warfield, Detroit, Mich. Filed Jan. 29, 1892.

494,053. Reciprocating Electric Drill. William A. G. Birkin, Nottingham, England. Filed April 23, 1892. Patented in England June 11, 1891, and in France April 4, 1892.

494,062. Secondary-Battery Electrode. William W. Donaldson and Roderick Macrae, Baltimore, Md. Filed March 4, 1892.



493,716—CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

494,091. Electric Cigar-Lighter. William M. Thomas, Chicago, Ill., assignor to Louis Warfield, Detroit, Mich. Filed Oct. 26, 1892.

494,098. Electrical Appliance. Charles H. Folger, Cincinnati, Ohio, assignor, by direct and mesne assignments, to the Cincinnati Novelty Manufacturing Company, same place. Filed Sept. 5, 1892.

494,111. Electrical Railway-Signal. Samuel W. Miller and Alexander C. Miller, Aurora, and Henry V. Miller, Bloomington, Ill.; said Samuel W. Miller, assignor to said Alexander C. Miller and Henry V. Miller. Filed April 4, 1892.

VULCANIZED FIBRE COMPANY,
Established 1873.
Sole Manufacturers of HARD VULCANIZED FIBRE,
In Sheets, Tubes, Rods, Sticks and Special Shapes to order. Colors, Red, Black and Gray. Send for Catalogue and Prices.
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THE CLARK COMPANY, NEW YORK, 192 BROADWAY,
CLARK is the only Company in the United States that makes a specialty of manufacturing under own patents, Electric Arc Lighting Apparatus for every purpose, including the finest arc lamp in every respect, suitable for any class of interior lighting, with plain or ornamental fixtures, and can be used on incandescent circuits, on any voltage from 65 upwards, in series or single, or on arc circuits of standard current.

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T. R TALTAVALL, Secretary and Editor.

REPRESENTATIVE.
JAMES B McCREARY, Brown's Building, Buffalo, N. Y.

Electrical books of all kinds can be procured at this office. Libraries can be furnished with a complete set of electrical works at a liberal discount from catalogue prices.

NEW YORK, APRIL 8, 1893.

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PERVERSITY.

No fair-minded person in the electrical trades will deny that a very great part of the prosperity in the electrical industry is due to the enterprise and unselfish efforts of the electrical trade papers. The business has been largely built up through their efforts, and yet there are scores of people in the trade who are so selfish as to deny the truth of this fact. When these persons were struggling for a business standing, and when they had to travel over the hard up-hill road, they were glad enough to "stand in" with their trade papers, but now that prosperity is to some degree on their side they haughtily snap their fingers and say "we can get along without the assistance of the trade papers." This is the way they appreciate what the papers have done to build up their business. There is no accounting for the freaks of some of the electrical houses. We know of certain ones who persistently refuse to advertise in the legitimate trade journals, but who squander their money on alleged electrical papers that have no real claim for electrical patronage that we can discern. Why shrewd business men will advertise in journals that do not reach the class of people who purchase their goods, and refuse to encourage the papers that do go directly to the buyers and consumers is a profound mystery.

THE INSTITUTE HEADQUARTERS AT THE WORLD'S FAIR.

Under the proposed plan, as set forth on another page in this issue, the headquarters of the American Institute of Electrical Engineers at the World's Fair will be a place of great attraction to the electrical fraternity. It will be a general electrical rendezvous, and visiting electrical people will be made quite at home. Every convenience and many comforts will be afforded members and visitors, and with the proposed exhibits of objects of scientific and historical interest the attractions will be sure to draw considerable attention. In short, the committee having the matter in charge intend that the Institute headquarters shall constitute one of the most interesting features of the electrical department of the Fair. Attention is called to the communication from the committee, which is printed on another page.

A SUCCESSION OF FIRES.

Monday, April 3, was a bad day for electric power houses in this vicinity. At 2 A. M. a fire broke out in the oil room of the car house of the Orange electric railway line, in Newark, N. J., resulting in a total loss of the building and 26 electric cars. The loss is estimated at $100,000. At 5:45 P. M. fire broke out in the oil room in the power house of the Brooklyn City railroad at First avenue and 52d street, causing trifling damage; it however, caused a suspension of traffic on the rails for half an hour much to the inconvenience of the great throng of people homeward bound. On Sunday, the 2d inst., the *Telegraph Age* office, in Temple Court, this city, together with many others on various floors, received a severe scorching.

THE LATEST EDISON VICTORY.

The General Electric Company has won another victory and it looks as if it might be the forerunner of a large number of suits involving what is known as the Edison "Feeder and Main" system of distribution. The case in question was tried hefore Judge Greene in Trenton, N. J., who rendered a decision in favor of the General Electric Co.

A NOTABLE BOILER PLANT.

The accompanying illustration shows the boiler plant in use at the station of the United States Electric Lighting Company, in Washington, D. C. In number there are six boilers, of the "National" water-tube type, aggregating 2,500 horse-power, nominal; their effective capacity, however, is largely in excess of this figure.

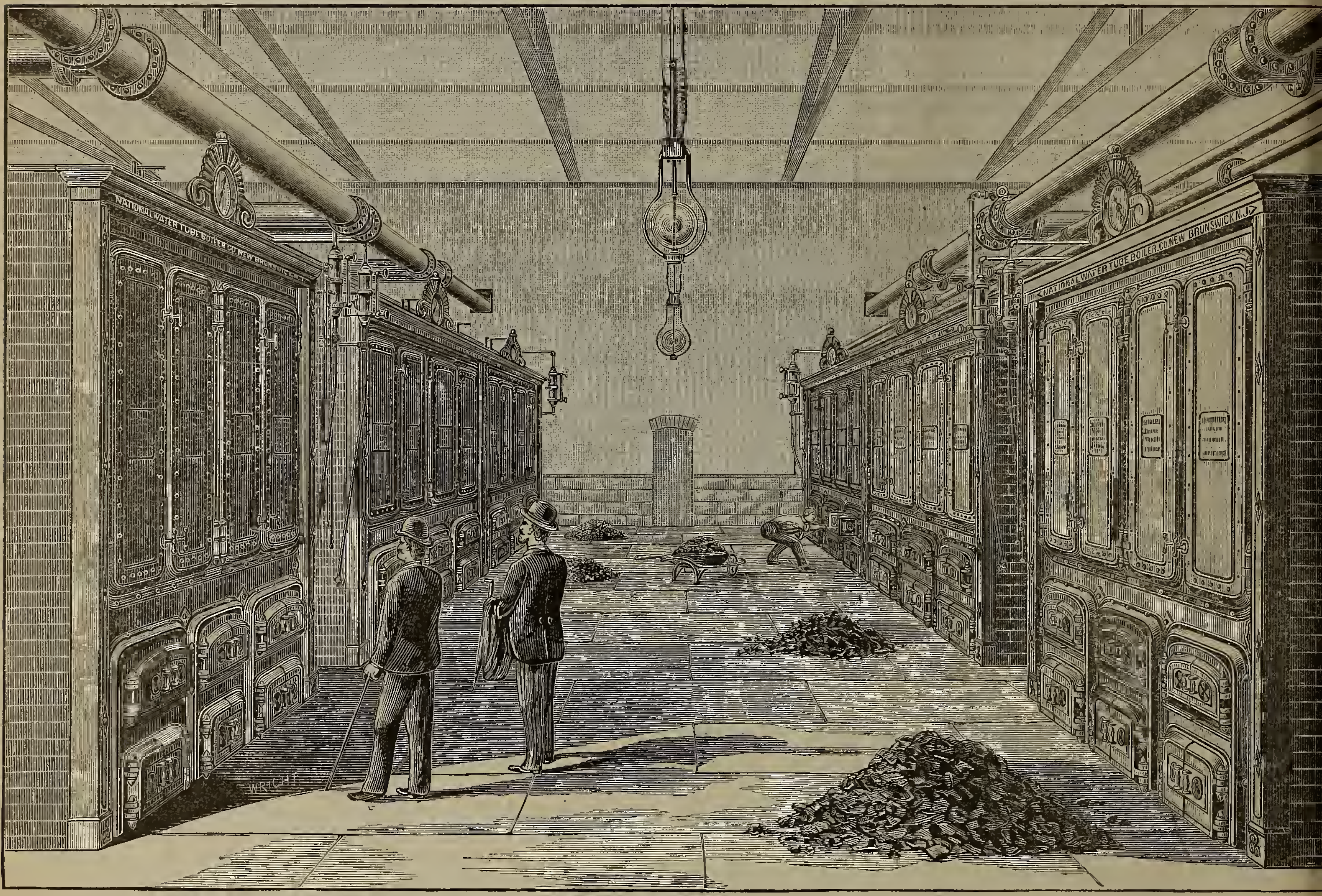
When this installation was planned the problem was presented of generating a large amount of power within a small space. This was accomplished by massing in each boiler a large amount of heating surface, at the same time retaining all the necessary advantages of access for examination and cleaning, both internally and externally. Each of the boilers of this plant has three storage drums which gives ample storage capacity. The advantage of such provisions is important where the demand for steam is sudden and heavy. Each boiler is set independently and has independent steam and water connections, in order that one or more may be shut down for cleaning and examination without disturbing the others. There are three furnace openings to each boiler allowing one-third of the grate to be cleaned or replenished without disturbing the balance. Ample cleaning doors are provided in the sides of the boiler walls through which all parts requiring cleaning may be readily reached, and the large door provided at the rear of each boiler setting allows free entrance to the rear of the boiler and flue.

The ordinary working pressure is 140 pounds to the square inch, but the limit of safety is largely above that pressure, and the working pressure may be increased if desired.

The engine plant of the United States Electric Lighting Company comprises compound engines of the most modern type, and with the economy reached by the use of the "National" boilers and compound engines, the best results in modern steam engineering are reached.

The construction of the "National" boiler is such that it can be readily adapted to local surroundings, and where necessary the space required for a large plant may be greatly reduced by a change in construction.

These boilers are made by the National Water Tube Boiler Co., of New Brunswick, N. J.


NATIONAL WATER TUBE BOILER CO. NEW BRUNSWICK N.J.
WRIGHT

BOILER PLANT, UNITED STATES ELECTRIC LIGHTING CO., WASHINGTON, D. C.

IMPORTANT DECISION.

On March 28, Judge Greene, of the Federal court, in Trenton, N. J., rendered an opinion in a suit which will have a very important effect on the electric light industry. The suit was brought against Westinghouse’ Church, Kerr & Co., by the Edison interests to determine whether the method used by the Trenton Electric Light Company for the distribution of electric current was an infringement of the Edison patents. The date of the Edison patent is September 19, 1882, and the system patented is generally known as the "Feeder and Main system." It involves municipal lighting by incandescent lamps and the lighting of large buildings, or groups of buildings, as well as over extended areas, and relates to a means whereby electricity generated at a central station is delivered over large areas at substantially equal and uniform pressure throughout the whole system of distribution. Judge Greene's decision is in favor of the Edison claim, and it is stated that the effect will be to involve the various companies throughout the United

States now using this system of distribution. Millions of dollars are involved in this matter, and it is reported that the World's Fair lighting contract is affected by this decision.

NEW FAN MOTORS.

Now that the winter season has passed away our thoughts naturally turn to the approaching summer, when nature will be at her loveliest, and humanity will once more be able to enjoy to the full all of the good things that nature bestows upon us. To be sure with the summer comes warm weather, but there are easy ways of keeping cool, even if it is warm. In the winter time, when nature's breath is too cool for personal comfort, we must produce artificial heat to keep our bodies at the proper degree of temperature. In the summer time the conditions are reversed. The natural heat is too great for comfort, but, happily, we have convenient and cheap means of providing ourselves with artificial cool breezes. There are several ways of keeping cool in the summer time ; the principal, best and most convenient of all being by using electric fan motors.

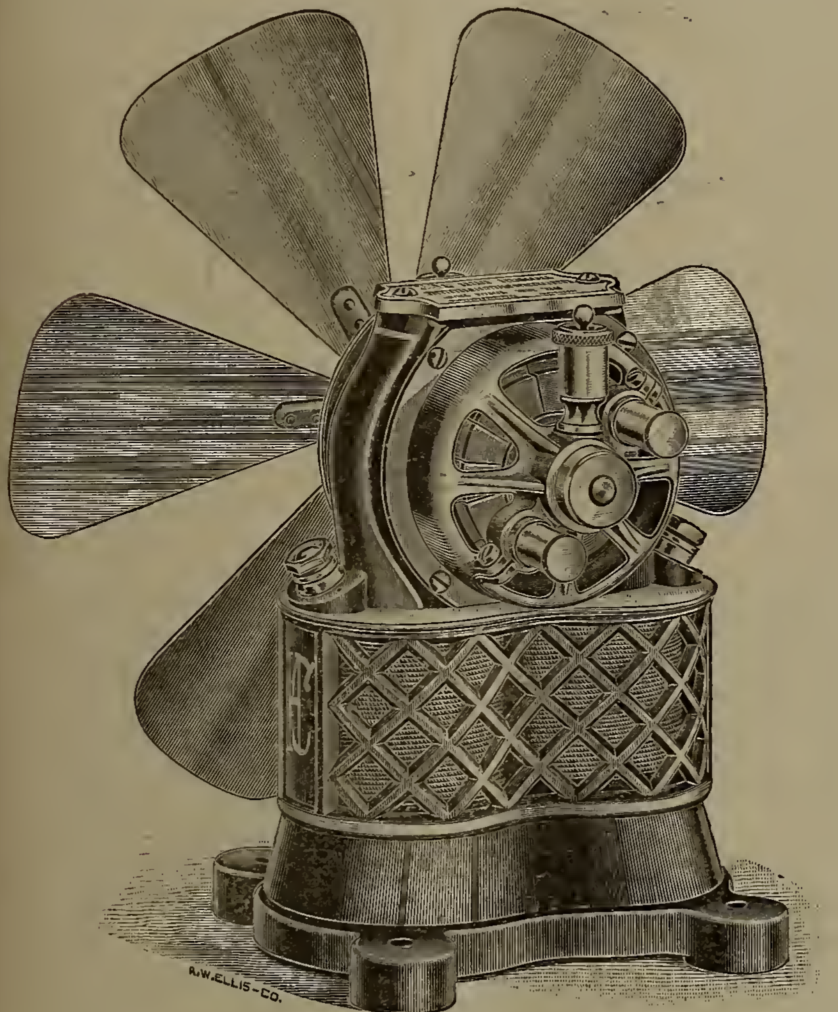


FIG. 1.

These machines have brought more comfort to humanity during warm weather than anything else has ever done. At home, in the reading-room, at the table, in the parlor or in the sick room, a fan motor will keep the air in motion and delightfully cool, rendering it comfortable even in the hottest of weather. The popularity of these machines is attested by the large and increasing output every year, and this season promises to see a greater number manufactured and in use than ever before.

We illustrate herewith two new fan motors which will claim public attention the coming season. They are made by the Holtzer-Cabot Electric Company, of 92 Franklin street, Boston, and possess sufficient merit to warrant a brief notice. These fan motors, which are handled in New York City by Messrs. Stanley & Patterson, 32 and 34 Frankfort street, are made for both direct and alternating currents.

The direct current machine is shown in Fig. 1, which gives a view of the back of the motor while Fig. 2 gives a front view, showing the guard in position. These machines are first-class in their mechanical and electrical features, and are finished in the highest style. They run absolutely noiseless, require no attention and can be placed in any position. These motors of two different speeds are carried in stock. These speeds are 1,100 and 1,600 revolutions per minute, but other speeds can be provided when desired. These, however, are usually found to suit all requirements. Three motors of a speed each of 1,100 or five at 1,600 revolutions per minute can be run in series on a 500 volt circuit.

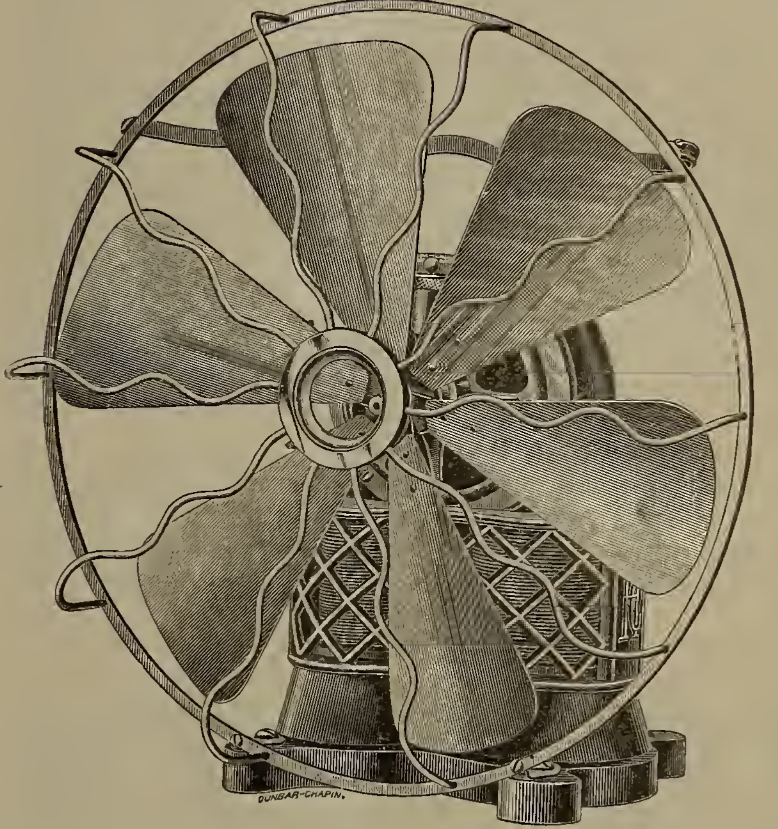

DUNBAR-CHAPIN.

FIG. 2.

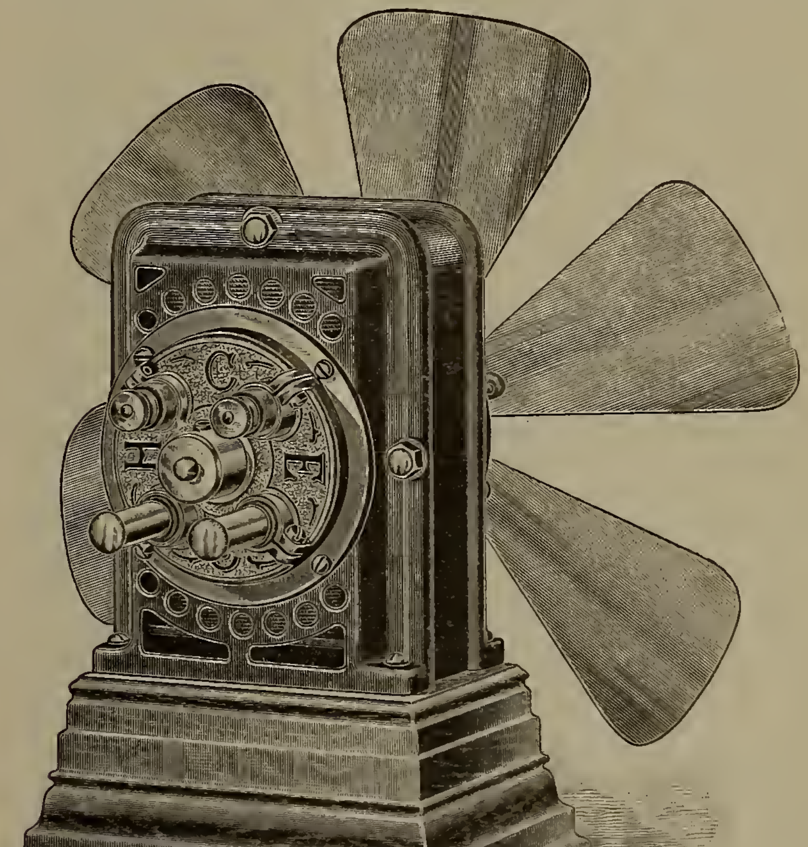


FIG. 3.

The direct current fan motor is wound for 110-volt circuits, and is of 1-10 H. P. The bearings are self-aligning, of phosphor bronze and lubricated by grease cups. The brushes are of carbon and are non-sparking and self-feeding. The armature is of the ring pattern, with "H. C." spider, and the weight of the machine complete is but 18 lbs. The fan is made of brass and has six blades. Aluminum fans are also made. The guard, it will be noticed, is a substantial affair; usually guards for fan motors are rickety and unsafe.

Fig. 3 shows a 1/8 H. P. alternating current fan motor. It is the outcome of long experimenting and practical tests, and the manufacturers believe that they have an alternating motor that will always go, and work efficiently. In design it is multipolar, the fields and armature being finely laminated. The commutator is substantially constructed and pencil radial carbon brushes are used. Heating, sparking and wasteful consumption of current are said to be totally absent in this machine. This motor is well made and finished, and runs at a speed of 1400 revolutions per minute. At this rate it consumes about 1½ amperes at 52 volts, operating a fan of 12 inches diameter.

Messrs. Stanley & Patterson, the New York agents, have just ordered a lot of 50 of these alternating current machines, and have an abundant faith in them, and will push them with extraordinary vigor this season, being confident that they are excellent machines.

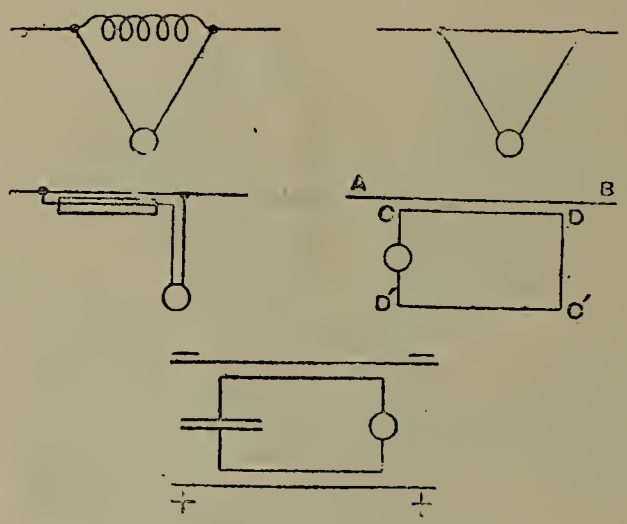
COMMISSIONS.

The following is an abstract from an address of Alfred R. Wolff, M. E., delivered at Stevens Institute. It relates to the pernicious custom of accepting commissions in one way or another on construction work by engineers and designers, which practice Mr. Wolff severely condemns.

"We are engaged by a client," says he, "to write a specification and make plans on which general contractors will bid, and we are to superintend the work. Many machines must be specified. They have a staple market value, and whether we specify some devices or others, all equally good, and of the same cost, the work will not be affected either in value or in price, as far as the competing bidders or the client's purse are concerned. Along comes the salesman and offers us a commission, a bribe, if we will specify his devices. We remonstrate, are indignant, and order him out. He argues that his goods are sold for a standard price to the competing contractors, and that if we do not accept the commission he is simply so much in pocket. Or, we see nothing of him until after the contract is awarded. We have specified his machines because they are the best or most suitable, and after the award he calls on us and urges us to accept a fee in recognition of our having specified his goods. Or, the general contractor, after award or completion of contract, desires to pay us a commission or a percentage of his profits. Every attempt is made to prove that our client gains nothing by our refusal, that we are fools not to accept the commission, and the monetary returns seem large and easy of attainment. Do not be deceived by the tricks of these philanthropists who are so anxious to get rid of their money. Advise them to spend it on public charities instead. Drop them a hint that you well know their game. They wish you to see their machines and their work, if not on this special contract then on the next, through the refracting medium of the dollar bill, obscuring your vision and biasing your judgment. Let your conscience not falter for a single moment. I may take an extreme view, but it is my firm belief, and I consider it a privilege to say it here, on this occasion publicly, that the engineer who receives a commission in this way is a thief, unknown to his client and the law, but to his own knowledge a convicted criminal in the power and under the final and absolute command of the party who has purchased him."

EXPERIMENTS WITH HIGH-FREQUENCY CURRENTS.*

The interesting experiment of Elihu Thomson, which consists in lighting an incandescent lamp by shunting it with a few turns of copper (Fig. 1) traversed by a high-frequency current, is well known. At the exhibition of the Société de Physique, M. Janet repeated this experiment with success, but replaced the spiral by a simple rod of copper (Fig. 2). The phenomenon appeared explicable, as in the case of Elihu Thomson's experiment, either by the self-induction of the rod, or by an actual increase in its resistance. M. Janet has, however, recently shown in a simple manner that the effect should be attributed to mutual induction. He brought one of the wires of the lamp circuit parallel to the principal circuit, as shown in Fig. 3, insulating it by a glass tube; the lamp went out immediately. If a rectangular C D C′ D′ is brought up to the rod A B, a lamp in the circuit C D C′ D′ lights up (Fig. 4). If the circuits are arranged as in Fig. 5 and a condenser is introduced into the circuit C D C′ D,′ the lamp brightens up if the conditions are suitable. In fact, if we have a variable inductance in the circuit C D C′ D′, the capacity being fixed and the inferior to a certain value, the brilliancy of the lamp attains a clearly marked maximum for a certain value of the self-induction. This maximum occurs when the period of the secondary circuit is equal to that of the primary current. On the other hand, if the capacity of the primary circuit is altered, it is found that in order to obtain the maximum brilliancy either the capacity or the self-induction of the secondary circuit must be similarly altered. This circuit, therefore, reassumes for such frequencies its true *role* of resonator of which the experiments of MM. Sarassin and De la Rive have deprived it in the case of Hertzian oscillations. It may probably be concluded that in the case of frequencies such as those employed by Elihu Thomson damping out is much less rapid than for Hertzian oscillations.



FIGS. 1, 2, 3, 4 AND 5.

Phonographs at the World's Fair.—The North American Phonograph's World's Fair exhibit will occupy 1,445 square feet—the entire end of upper floor on the south side of the electrical building near main entrance. The general manager, Mr. Thomas R. Lombard, will supervise the entire exhibit and it will exceed anything ever attempted in the past in this line, excelling the Paris and London exhibits. Fully forty phonographs will be in actual use in the different departments which will be sub-divided as follows: commercial, educational, household and amusement.

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* La Lumière Electrique.

THE INTERNATIONAL ELECTRICAL CONGRESS.

In our issue of January 28, last, we published the recommendations of the sub-committee of the American Institute of Electrical Engineers' committee on provisional programme for the International Electrical Congress to be held in Chicago this summer during the World's Fair. These recommendations were considered at a recent meeting of the Société Internationale des Électriciens, of Paris, and we give herewith a résumé of the discussion, taken from the columns of our English contemporary *The Electrician*.

M. Blondel was of opinion that the definition of impressed electromotive force was a bad one, and tended to confusion. He demanded its withdrawal. He wished to keep the expression "difference of potential," and considered "voltage" slang In his opinion there was no need to replace the word "permeability" by "inductivity," which did not appeal to the mind so much. The Committee of the American Institute of Electrical Engineers had defined "reluctivity" inaccurately, and the need for the term was, by no means, self evident. He would suggest that the unit of illumination, the *lux*, should be equal to that of one bougie at one metre. He did not agree with the adoption of the Hefner-Altneck amyl-acetate standard, which was difficult to use and of insufficient accuracy, whilst the carcel, or, better still, the Violle standard, were much more accurate. The speaker then exhibited a standard arc lamp based on the fact that the intrinsic brilliancy of the arc was constant. He (M. Blondel) had experimented, together with M. le Chatelier, upon carbons of various qualities, and had not observed any variation in their intrinsic brilliancy.

M. Guillaume suggested that the termination "ity" should be reserved for properties of matter—for example, "resistibility"; whilst the termination "ance" should denote a fraction—for instance, Resist*ance* = Resistibil*ity* × S/1. The term "inductance" was unnecessary. "Inductivity" was useless; moreover, there was an error of sign in its definition. The word "permeability" was handier. He would support the names of "gauss" and "weber," but not those of "gilbert" or "oersted." In any case, the size of the practical units should be such that the system was coherent.

M. Hospitalier voted for the radical abolition of the expression "bougie-meter"; the unit of illumination was the bougie at one metre. M. Hospitalier then read a letter which he had received from M. Potier with which he entirely agreed. M. Potier held that the units should not be called absolute but merely C.G.S. The "weber" was useless, since the C.G.S. unit of both total magnetic flux and of magnetomotive force sufficed. "Inductivity" had no *raison d être* since we had "permeability." The expression *flux* was simpler and less ambiguous than "total induction." There was no need to give a special name to the ampere-hour or kilowatt-hour.

The discussion was then adjourned to the next meeting.

ELECTRICAL ENGINEERING AT THE UNIVERSITY OF MINNESOTA.

The electrical engineering department of this University shares rooms with the department of physics, and has free use of all its apparatus and facilities for work. In addition, the department possesses a number of dynamos, including a 150-light Edison, 300-light Slattery alternator, 15-ampere Slattery exciter, 9-light Thomson-Houston arc machine, 0.5-K W and 0.6-K W Edison motors, full complement of instruments for each of the dynamos, 5 arc lamps of different types, 4 transformers, 10 adjustable rheostats for heavy currents, 2 lamp boards for 20 and 60 lamps in various combinations, 33 300-ampere-hour secondary cells, 150 secondary cells for potential, 50 primary cells of various types, a cradle dynamometer, Weston double-scale (0-150 and 0-750) voltmeter, Weston (0-150) ammeter 12 other ammeters and voltmeters, 30 galvanometers of various kinds (including 3 torsion, with shunt and series coils for potential and current, 1 D'Arsonval, 2 ballistic, 2 electro-dynamometers, and 2 Thomson reflecting), 8 Siemens & Halske resistance boxes. 3 standard ohms, 2 box bridges, 6 divided wire bridges, Kruss incandescent lamp photometer, 12 telescopes and scales, magnetometer, a number of silver and copper voltameters, sets of telegraph and telephone instruments.

The library is being rapidly increased by the addition of the best and latest electrical books and trade catalogues.

FIRES BY ELECTRICITY.

To ascertain how dangerous electric wires are in causing fires, one has but to consult statistics, and the results would probably be surprising to those who think electric wires are a source of a great many conflagrations, says *Fire and Water*. Not near so many fires are caused by them as is generally supposed. The returns from seventy-six cities all over the country show that in 1892 there were 1,230 fires with a total loss of $1,629,413. Of this, but ¼ per cent. were caused by electric wires, involving considerably less than one per cent. of the whole loss.

These figures include loss from a fire at Minneapolis, where $150,000 was destroyed at one fire, but this was afterwards proven to have been caused by an overheated car stove, and so could hardly be classified as losses caused by electricity. It also contains fires reported caused by electricity where merely an alarm from a crossed wire in the street or from electric cars catching fire, and where loss amounted to nothing or a very small figure. Electric power and light wires in themselves are said not to be a source of much danger. Usually telegraph and telephone wires which are put up with less care and are much weaker, and in breaking cross others, cause the trouble that emanates from electric wires.

Wires of all kinds have been strung indiscriminately, and many of these have afterwards been abandoned but not removed, and, as no one has kept them in repair, they become a considerable source of menace. The following shows the percentage of fires due to different causes in Boston for a period of several years. Out of a total of 3,396 fires, hot ashes from tobacco pipes, lighted cigar stumps caused 79 fires or 2.4 per cent. of total; rats and matches, 80 fires or 2.5 per cent.; fireworks, 404 fires or 3.1 per cent.; gas jets and explosions, 109 fires or 3 2 per cent.; defective flues, 116 fires or 3.6 per cent.; bonfires, 135 or 3.9 per cent.; heat from furnaces, steam pipes, etc., 140 fires or 4.13 per cent.; overheated stoves, 148 fires or 4.4 per cent.; matches, in connection with men and children, 73 fires or 1.8 per cent.; kerosene lamps, 317 fires or 9.3 per cent.; and electric wires, 56 or 1.6 per cent.

Lighted cigar stumps and hot ashes from pipes, fire-crackers and fire-works cause 90 per cent. more fires than electric wires; gas jets and gas explosions, 95 per cent. more; defective flues, 107 per cent. more; sparks, heat from furnaces or steam pipes, 150 per cent. more; and kerosene lamps, 460 per cent. more. Taking the classification given, electric wires are the most harmless item on the whole list. In this connection it should be remembered that Boston has 240 miles of trolley wire and many more miles of feeder wire and hundreds of miles of electric light wire, it must be admitted that the great fear in regard to the risks in electric wires is without foundation.

SOME EXPERIENCES WITH THE ALTERNATING SYSTEM.*

BY R. H. STERLING.

(*Continued from page* 140.)

This now brings us up to the remaining feature of the switchboard—the lightning-arrester—though I cannot say that, necessary as this last named appliance is, the switchboard is the all-important place for it. There may, however, be a lightning arrester on each side of every feeder, placed in a row on the top of the board or on the wall back of it, and a heavy copper wire running along past this row and connected to each arrester with a tap-wire, and the main wire leading to a good ground in as straight a path and with as few crooks and turns as possible, as every bend offers a source of self-induction detrimental to the flow of the lightning discharge. The source of ground cannot be too perfect; have several of them radiating off to different points, to a mass of metal in a well, or soldered to a water-main, so should one fail, the other may be relied upon. The lightning arrester itself should be an instrument devoid of fuses, be capable of rupturing instantly the arc formed, and still remain set for a second discharge; should be free from all moving parts; not absorb energy, and should be so reliable and substantial that they could be set up anywhere on the line and forgotten, and still perform their duty. This may seem to you like an ideal instrument, but, so far as alternating currents are concerned, I am positive that this state of perfection has been attained in a certain arrester now on the market. There is no question about the efficacy of lightning-arresters placed out on the line, if we wish to keep the lightning out of the station and protect our converters, especially in districts remote from other wires and tall buildings, as in the residence portion of lighting. It is a good plan to place one at the end of each feeder and branch main, and scattered at intervals midway on the circuit; they also are a wise protection over a large bank of transformers, notwithstanding the fact that we are taught to believe that lightning abhors an inductive resistance as nature does a vacuum, and that a collection of such resistance would be self-protection, yet it does not prevent the discharge entering the case of the converter; then it does not have to jump much more than the space of one-eighth of an inch over to the plates to ignore these inductive coils, reach the secondary outlets, and thence to the house wiring, when it generally finds an easy path to earth with the close proximity of inside wires to gas and water pipes, and especially on combination fixtures with poor insulating joints. This does not always completely burn out the converter, as oftentimes this discharge has only ruptured the primary coils on the first turn of the wire at the point where it has jumped to the frame holding the plates, and is easily repaired. I imagine this is the case when a discharge takes place when there is no dynamo current on the lines; at other times there is a complete destruction of both coils. In a great many instances we have traced converters burned out by lightning to defective insulation in the house wiring. Whether the ground actually existed before the disruptive discharge, or was caused by it, we could not always tell. I did find one place where the wire was fused to a gas-pipe up in the attic, the discharge evidently having jumped through the insulation, as the wire had been carelessly left resting on the pipe. Of course, the primary fuse, having blown in the burning out of the converter, did not leave the circuit permanently grounded. We do not want the house wiring a safety valve to relieve the circuits of their static charges, therefore, having lightning-arresters plenty of them, that will offer an easier path to earth across small arcing gaps, smaller than can be found in the converters; but no matter how perfect the arrester is it is valueless unless it has a good ground connection and a straight copper wire, not smaller than No. 6, without bends or turns, connecting the two. A very convenient method I have found to make a reliable earth connection for arresters out on the lines is to dig a hole at the foot of the pole about two feet in diameter, three feet deep and driving down through it a twelve-foot length of 1¼ inch galvanized iron pipe, having on the lower end a driven-well point to allow it to be driven easily, and a cap screwed on the upper end to prevent the sledge-hammer splitting the pipe. The No. 6 wire can be more thoroughly soldered to the pipe before it is sunk. The upper end should be driven to about one foot below the surface and the hole filled in with finely broken coke, which increases the conducting surface at that part of the earth that is the dryest, and the lower end of a twelve foot pipe will usually be in moist earth, and can be relied on to furnish a good connection at all times. I once had an electric light man tell me that he considered a small coil of wire buried just under the surface of the earth sufficient grounding, as the rain would immediately soak the earth and make all the ground he wanted. I have observed several lightning discharges that took place before a drop of rain had fallen.

While on the subject of the burning out of converters, I will mention an annoyance we sometimes meet with in a primary fuse blowing, arcing and welding the leading-in wires to the case, or so carbonizing the fuse-box that a short-circuit is formed on the line. This will always be the case where a fuse carrying a high-potential current blows in a pent-up space, with no chance for the gases to escape. The arc is being fed, and increases until a fuse is blown at the station and shuts off the supply of current. Generally, on throwing in this feeder again, after replacing the station fuse, it will be found to work all right if the wires are not fused to the converter case, or everything is not carbonized inside. We have in some instances, on its again blowing the station fuse, fused up a little heavier and finally removed the trouble, not fusing to that extent that it would wreck the armature. We are learning now that it is far preferable to have no primary fuses in the converter case, but a large primary fuse and switch-box combined, removed from the converter to protect it. We have long since discarded secondary fuses in converters, replacing them with copper wire; and let me remark here that this is what a member of this association meant when he made the statement before one of its conventions that we had been substituting copper wire for all our primary fuses, he evidently mistaking the primary for the secondary end of a converter. This would also be a sad mistake to make when fooling with hornets.

This short-circuiting of the line by the burning out of converter fuses and other causes led me to adopt a combined switch and fuse-box on all branch lines leading from the main feeders, and we have found them of immense benefit.

The switch cuts off all connection from the line-wires in fusing up, and also makes a convenient means of disconnecting that part of the circuit to locate grounds and other trouble. Then the greatest usefulness is their blowing when there is a short-circuit on the branch they protect, thus preventing every light on the rest of the circuit going out by the station fuse blowing. Then, again, it locates at once where the trouble lies by sifting it down to one of, say, twenty branch mains, by telephone calls pouring in that lights are out at such a place.

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* Abstract of paper read before the National Electric Light Association at its sixteenth convention, held at St. Louis, Mo., February 28 and March 1 and 2, 1893.

As alternating stations increase in size and larger units of dynamos are adopted—which is certainly a wise step towards economy—another class of appliances are required at the switchboard, namely, devices for independently regulating the state of pressure on any particular feeder, the dynamo pressure remaining the same. The necessity of this can readily be seen, for we will have, say, on the same dynamo, when it is of large capacity, several feeders of different loads; those carrying the greatest number of ampères requiring a higher electromotive force to overcome the drop on line, so that if this required pressure all came from one source, these feeders of lighter load would be receiving too much potential, and a large lamp breakage would be the result. Therefore, the potential of the dynamo is regulated for the lighter feeders, and pressure raisers or "boosters" used to bring up the potential still higher for the remaining feeders. The principle of these regulators is this: If we take a converter whose capacity equals the maximum load of the circuit and connect the secondary in series with one side of the feeder, and the primary across the two sides, we are then adding the fifty volts of the secondary of the converter to the 1,000 volts of the line, raising its initial pressure five per cent. Adding a number of these in series in like manner, and having a suitable switch to throw them in or out in succession, makes a very convenient means of raising the voltage, but resembles somewhat, as I once heard it remarked, a man raising himself up by his bootstraps. I have sometimes found it very useful connecting in ordinary converters at the switchboard, for temporary heavy loads, in this manner, where feeders were not provided with the regular "boosters."

Reactive or choking coils may be employed instead of "boosters," with the same end in view—*i.e.*, the proper adjustment of the pressure on feeders of unequal drop supplied from one source—only in their use they will be placed on the lighter feeders and the dynamo be made to raise the electromotive force for those having the heavier load. The first cost, I think, would be in favor of the reactive coils, but the relative economy in energy consumed would be slightly in favor of the pressure raisers.

A serious annoyance is often met with on the line from the inductive effect of two parallel circuits upon each other causing the lights to waver, or "pump," which better expresses it. When this trouble first manifests itself in a station, the engine is generally the first thing to be blamed, and the engineer is caused many sleepless nights or days in trying to remedy it.

We seldom find this effect in small stations, unless the feeders are parallel to each other for a considerable distance. It is most marked in circuits that are parallel and one of them carrying a heavy load, which exerts this inductive influence on neighboring lines on the same principle as the primary coil of a converter inducing currents in the secondary parallel to it; only in the case of this action on the lines where each line is fed from a separate dynamo, their phases, of course, not corresponding, we have in this cross-induction a very unsteady action in the current. Annoying as this trouble is, it is one of the easiest to remedy. First, see if some combination on the switchboard will not bring about a change in affairs. Ascertain if the several lines on which this trouble is noticed cannot be all run on the same dynamo; but if this should cause this induction to appear on other circuits formerly free from it, the then remaining way is to transpose the circuits midway between the starting point and where they cease to run parallel by inserting a break-arm in each side of the line, and joining in the shape of a cross the four ends thus formed. This will neutralize and break up the trouble completely.

These topics I have touched on in my paper have been chosen as those most interesting and worthy of discussion, and with the hope that they will be of benefit to some of you, and call to mind other experiences I have not mentioned, which, if given freely before a body of this nature, will help bring about the results we are all striving for—good service and dividends.

THE PRESENT AND FUTURE COMPETITION BETWEEN GAS AND ELECTRICITY.

BY JOSEPH GWYNN, STEUBENVILLE, O.

(*Continued from page* 199.)

In order to give each one opportunity to consider the subject for himself and to rely on his own judgment as to the best course to pursue in the future, I append a few figures in order to fully show the advancement of both branches of the business. To show the rapid advancement of one branch of the electric business, which is arc lighting, I append the following figures, showing the growth of the carbon business. Upon the introduction of the arc lighting business from the year 1879 to the year 1881, only a small amount was manufactured, and from what data I can obtain the total sales of carbons would not exceed one million per annum with prices ranging from $120 to $150 per thousand. From 1881 to January 1st, 1892, the amount of carbons manufactured and sold in the United States has gradually increased until to-day there are upward of 145,000,000 of carbons being manufactured and sold annually with price ranging from $9 to $10 per thousand. From the above figures it will be seen that the arc lighting business has shown an average advancement of over 12 per cent. per annum for the past 12 years. While the arc lighting business has shown a rapid advancement for mainly public lighting, what effect do we find this has had upon public lighting by gas companies? To-day out of over 928 gas companies in the United States, we find of that number only 435 have contracts for street lighting and 493 have lost the street lighting business entirely which has been displaced by arc and some few incandescent lights. While, on the other hand, a great many of the gas companies who still do street lighting, do only a limited business in this line as street lighting by gas is being gradually displaced by electricity and will eventually be a thing of the past. Let us again consider the two great competitors from a commercial lighting standpoint and what are the results? The aggregate gain in output of 27 gas companies for the year 1891, is 6.56 per cent. and for the year 1892, 6.61 per cent. or a net gain of 13.61 per cent. for the output of 1892 over that of 1890. For comparison, I will now show the aggregate gain of the commercial electric lighting business. In 1891, the aggregate number of incandescent lamps then installed by 14 electric companies was 16,475 and in 1892, the aggregate number of lamps then installed, had reached 33,238, showing a net gain of over one hundred per cent. in the past year. From the above figures, it will be plainly seen that the net increase of commercial incandescent lighting for the past year over gas is ninety-three per cent. In addition to the incandescent lighting business of the above electric companies, I find that in 1890, they had then installed 1,047 commercial arc lights and in 1891, they had increased to 1,149 and 1892, to a total of 1,620 lights, showing a net gain in the past two years of over fifty-four per cent.

Again, let us look at the lighting question. It has been claimed by most gas managers that electricity could not compete against gas for day lighting as the business was not sufficient to justify an electric company to operate day circuits only in large cities. In this respect, I wish to say they have been mistaken for I find that quite a number of electric companies in cities of 20,000 population and under are operating day circuits or, in other words, are operating their plant for the full 24 hours. I am asked how they can afford to operate a day circuit without continual loss. I wish to reply to this question by saying, that in addition to what lights are required, the constant demand for ventilating fan motors, from which a good revenue is derived, enables an electric company to operate a day circuit at a small profit. To give you an idea of the growth and prosperity of the ventilating fan motor business, which is being rapidly introduced by electric companies, I append a few figures obtained from the manufacturers as to the sale of fan motors for the years 1891 and 1892. In 1891, the sale of fan motors by four of the principal electric companies was 2,012. In 1892, the sale of fan motors by the same companies was 5,093 and the companies above referred to stated in their report to me that from the present outlook, the sales of fan motors for the year 1893 will be fifty per cent. greater than for the previous year. In order to further enlighten you on the possibilities of electric companies operating day circuits, I wish to call your attention to the following figures showing the enormous increase in the sales of motors used for isolated purposes and independent of street car use. In the year 1889, the sales were, practically speaking, nothing, as the reports obtained show an aggregate sale of 175 horse power. In 1890, the aggregate sales of motors of five of the principal electric companies show 6,584 horse power. In 1891, the aggregate sales of motors by six of the principal electric companies were 9,657 horse power and for the year 1892, the aggregate sales of seven of the principal electric companies were 19,216 horse power, or, in other words, the total sales of motors for the past three years by seven of the leading electric companies show an aggregate of 35,457 horse power. This branch of the business, if you will stop to think, comes in competition with the gas engine business, and while I have no figures to show the aggregate horse power of gas engines sold for the same period, yet at the same time, I venture the assertion that twenty-five per cent. of the sales of motors would be a fair estimate for the sales of gas engines. This branch of the motor business, looking at it from an electric standpoint, is not as easy to handle nor possibly not as profitable as is the gas engine business to gas companies. While the gas company can furnish the gas required for gas engines through the same line that is used for illuminating purposes and without increased expense, it is impossible for electric companies to furnish current for motor use from the same circuit used for lighting. As I stated above, fan motors can be operated on the electric lighting circuits, but when an electric company undertakes to operate anything larger than fan motors from a lighting circuit, the continual stopping and starting of the motor will cause a variance in the lights.

There is no doubt but that electricity has made rapid advancement over gas in the past, and while it will continue to advance possibly more rapidly than will gas yet, at the same time in the future, the advancement will be somewhat checked as the novelty has worn off. Yet, on the other hand, the continued improvements, which are many and great in electrical appliances, will continue to make the electric business more simple and reliable, and will still hasten its progress rapidly on for some years to come. In conclusion, I wish to make mention of a few facts that may be of interest to gas companies. My advice to all is to stand firm and push your business with all the vitality you have. Strive to make as good quality of gas as is possible at a minimum cost, and sell at the lowest price possible to give a fair return on the capital invested. Again, let me urge upon you the necessity of pushing your gas heating and cooking business as rapidly as possible, as this is an almost unlimited field for gas companies, and one that is not likely to be disturbed in the near future, by your co-competitor, the electric light company.

CAN A PRACTICAL ALL SOLID INCANDESCENT LAMP WITHOUT VACUUM BE MADE?

By F. M. F. Cazin

Industrial practice has so far been concerned only in two main classes of incandescent lamps, each of these two classes including a number of different species.

The division of the two main classes is one of method applied for the protection of incandescent matter against combustion. In one class (the one now exclusively the object of manufacture and sale) the incandescent matter is protected by inclosing it in a vacant space and in the other class the incandescent matter is protected by enclosing it in a space filled with inert gas.

The species in the first class are distinct from one another by shape or treatment of the carbon filament and by the methods applied for creating and maintaining the vacuum.

The species of the second class are distinct from one another, mainly by the nature of the inert gas employed; secondly by the gas being employed with its normal density or only as an intermediate factor in the obtaining of a vacuum and consequently in a highly rarefied condition; and, thirdly, by the same distinction relating to carbon matter and to the exclusion of the atmosphere from the protecting space, by which the species of the first class differ from one another.

If, so far, the second class has not attained the commercial importance that it evidently deserves, the cause must be found in the fact that the use of the vacuum appeared sufficient for all practical purposes, and that no new advantages could be secured by using inert gas as against the vacuum lamp. Of the practical possibility of such a lamp reasonable doubt, derived from the known nature of things, cannot well be maintained. Nevertheless, "not all is gold that glitters" in this direction. Gases, believed to be inert to carbon matter, prove under application of electric energy not to maintain their inertness. Morren, the chemist, obtained cyanogen by passing an electric spark between carbon poles through a space filled with nitrogen. The inert-gas lamp has to face another condition of danger—not the theory only—in which is concerned not the preservation of the filament but of the glass globe.

The inert gas, when employed to fill the glass globe is, under change of temperature, subject to constant and considerable changes of volume or pressure. While in lamps of the first class the surrounding globe must resist the almost constant pressure of the outside atmosphere, subject only to barometrical variations, the globe in lamps of the second class will have to resist pressure from inside, unless the inert gas introduced is rarefied to such a degree as to exercise, when in its maximal temperature, pressure not in excess of that of the atmosphere, otherwise excess of pressure from the inside of the globe must be the result, and while the form of the globe is adapted to resistance to outside pressure, it is not adapted to resist pressure from the inside.

In view of the general desire to find a substitute for the lamp of the first class, and the existing scepticism as to the practical value of the lamp of the second class, the question naturally arises: "Is there no possible third class of incandescent lamps, applying a third and different method for protecting and preserving the incandescent matter, and avoiding the dangers threatening the fragile globe as involved in the use of the vacuum as well as of inert gas?" There is indeed such a third class.

In this new and third class of incandescent lamps the incandescent matter is protected against combustion not by a vacant space; not by an artificial atmosphere of inert gas, but by being closely and hermetically embedded in and covered up (mainly by non-conducting) transparent solid matter (glass, etc.)

It is not probable that those versed in technical matters will raise a doubt as to whether, when once properly introduced and hermetically sealed, incandescent matter can be thus permanently protected against the deteriorating influence of the air, that is, as long as the embedding glass remains entire. All possible doubts would concern the manner of embedding the incandescent matter without spoiling it in the process, and the preservation of the embedding body of glass.

When the idea of the all-glass incandescent lamp is first expressed, the technical mind is at once disturbed by the remembrance of the platinum wire, melting under the influence of the electrical current, and the conclusion is jumped at: "This will not do, the glass would be melted," and other preconceived ideas, such as the energy used in heating up these inert gases (in the new case, the embedding glass) is lost for the production of light, (compare Dr. L. K. Böhn in the *Electrical World* XXI p. 4). Such notions present themselves, and cause not only scepticism, but positive antagonism to the promised new competitor in the field of electric incandescent lighting, the "all-solid lamp." With the use of two solid pieces of which one receives in an intaglio impression the incandescent matter, and the other serves to hermetically cover the face of the first one and to be joined therewith to one body, there is offered not only the possibility of selecting material that will resist fusion and decrepitation, but also of giving to the incandescent line or lines the shape of artistical designs of great variety.

The practical questions in connection with the all-solid-lamp may be stated as follows:

(a) Will the heat emanating from the incandescent matter melt the embedding glass or other material?

(b) Will it disfigure the glass-part by rendering it plastic or opalescent or by cracking it, or can such glass be applied, as will neither fuse in part, nor crack, nor become milky?

(c) Is the power requirement of the all-solid-lamp materially in excess of the vacuum lamp for the same candle power?

To properly investigate the apprehended possible damaging effects of the heat on the body of the lamp, it is advisible to establish the heat value as it is produced by electric incandescence.

The heat quantity per second produced by a vacuum lamp of an average of 4 watts per candle, and for 16 candle power would be represented by 16 x 4 watts x 0.24 gm. calories-15.36 gm. calories, that is, the lamp would raise the temperature of 15.36 cubic centimetres (gms.) of water 10 C. per second. If 15.36 gms. of water should be raised to boiling point, and all radiation of heat and light were concentrated to and preserved in its value, then it would take 100 seconds to accomplish this. Electricians apparently have overlooked this fact, because they have so far never attempted to rate incandescent lamps by quantity of heat evolved, but have rated them by the less reliable method of measuring their radiation of light.

By the nature of things light cannot conveniently be reliably measured as a total effect, but only in part; that is, as cast in one direction, the measurement of total effect being impossible with the instruments in common use.

It is different with heat effect. With well-known apparatus, by dipping the lamp into the water-bath therein contained, the total heat quantity emanating from the incandescent lamp can be measured. If it be considered, as is well known, that of the electric energy applied to the incandescent lamp only about ten per cent. is converted into heat energy of the light radiating quality, while ninety per cent. is converted into heat of the dark radiating quality, it must become apparent that measuring the light does not completely cover the case, but it covers a partial test only. Therefore the measurement by light effect is approximate only, as to the percentage of light evolved, as above alluded to, and such percentage varies with the matter that is made incandescent as well as with other given conditions.

It has been conclusively demonstrated that radiated light and radiated heat are identical—are one and the same form of energy—and not different forms, as heat and electricity are. Human perception, however, makes a distinction between the effect of the same cause, when the impression is either received on the optical nerve or on those nerves which convey sensation from the general surface of the body to the brain.

And true it is, as Tyndall and others have shown, and as it is stated above, that of the total heat value produced in an electric light only ten per cent. is in the form of light radiation, while ninety per cent. is in dark rays, or in purely heat radiation. The ninety per cent. of the heat produced in incandescent matter may radiate therefrom without *lessening or increasing the incandescence* by its radiation, or retention.

Proof of this fact may be demonstrated by the possibility of incandescence being imparted electrically to matter inclosed in ice, which absorbs all of the dark heat rays, but permits the luminous rays to pass through.

The conversion from electric energy to incandescent heat being a continuity of instantaneous effects, the manner in which the 0.24 calories per watt-second are absorbed by increase of temperature of surrounding non-conducting matter is irrelevant as far as incandescence is concerned.

Although incandescence begins instantaneously in a vacuum, it terminates by degrees, thereby allowing the conclusion that the effect for continuous temperature of incandescent matter is increased by a residue of heat remaining in the incandescent matter from instant to instant; hence, that higher incandescence or luminous effect be maintained by retention of heat in the incandescent matter, that is by surrounding it by non-heat conducting matter. Therefore, before discussing the question as to whether the heat emanating from incandescent matter will destroy the solid, in which it is embedded, it is also proper to consider the effect of the solid on the preservation, increase or destruction of the incandescence itself.

In this connection the pertinent question arises, "Which of the three classes of incandescent lamps employing 1, vacant space and glass; 2, inert gas and glass; 3, solids (in part glass) alone, is the inferior heat conductor and in consequence the superior preserver of incandescence?"

(*To be continued.*)

Every street car line in Milwaukee, Wis., except one, is now operated by electricity.

HISTORICAL EXHIBITS AT THE OFFICIAL HEADQUARTERS OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS AT THE WORLD'S FAIR.

New York, March 29th, 1893.

To the Editor of The Electrical Age.

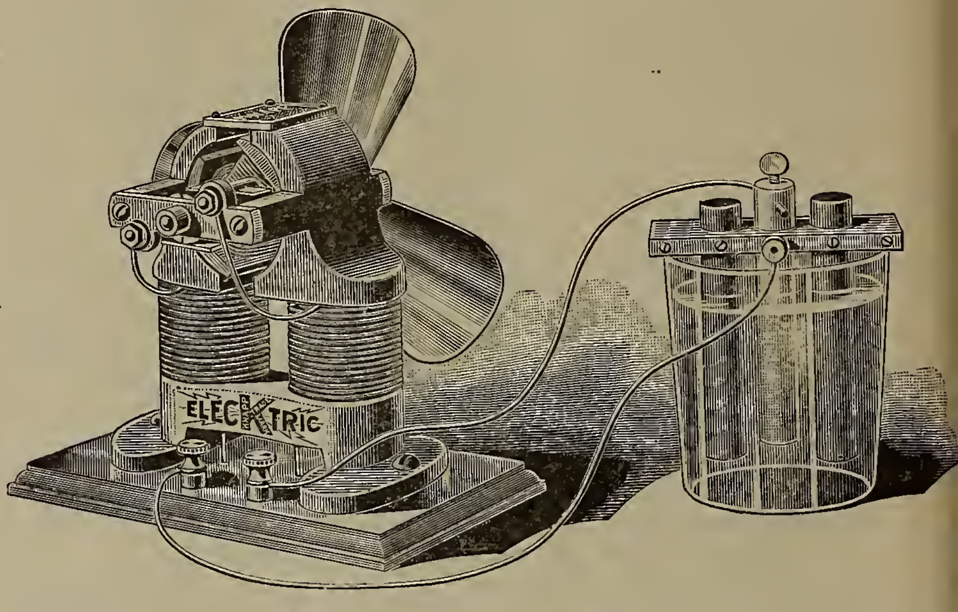
Dear Sir :—At the last meeting of the Council of the American Institute of Electrical Engineers, the Committee on Ways and Means, who have charge of matters pertaining to the official headquarters of that body at the World's Fair, presented a report and the Committee was instructed to insert a notice in the technical papers calling attention to the fact that the Institute had secured through the coöperation of the authorities at the World's Fair two rooms adjoining the offices of the Electrical Department in the Electricity Building. These headquarters are now being furnished and the Secretary of the Institute, Mr. Ralph W. Pope, will be in general charge of the headquarters during the exhibition, and the Committee, on behalf of the Council, wish to extend an invitation, not only to the members of the American Institute of Electrical Engineers, but to any and all of our foreign friends of the electrical profession who may visit our shores during the coming World's Fair, to use these rooms as their headquarters. Letters may be addressed in the care of the Secretary at the headquarters, and in the furnishing of the rooms facilities will be given for writing letters, meeting friends, reading technical papers which will be placed on file, leaving their parcels and securing general information upon the Electrical Congress and other meetings, and World's Fair matters generally. The rooms will be equipped with a long distance telephone and telegraph service, fire protection and the authorities have promised to place one or more members of the Columbian guard at the headquarters. The Institute has decided to place in these rooms various objects of great scientific and historical interest, such as photographs, pictures, autograph letters, rare electrical books, models, instruments, etc. These things will be properly classified and arranged, and the Committee request that all parties having objects which would prove of interest in value in this connection to communicate with the Secretary, Mr. Pope, at the headquarters of the Institute, No. 12 West 31st Street, New York City, or with the Chairman of the Committee, Mr. William J. Hammer, 527 Temple Court, New York City. As we are somewhat limited for space the Committee will be compelled to select only objects which are not too bulky and which are of great interest and value, and they propose to make the headquarters of the Institute one of the most interesting features of the Electrical Department of the World's Fair. As the time is very limited, the Committee trust that a prompt response will be given to his call, and that all the members of the Institute will feel a personal interest in seeing that the exhibit made shall be as full and as valuable as possible. The Secretary was instructed by the Council at the last meeting to extend an official invitation to the foreign electrical societies to avail themselves of the privileges of the Institute.

Wm J. Hammer,
Francis R. Upton,
W. A. Kriedler,
Committee.

The Edison Electric Light Company, of New York, represented by the General Electric Company, has brought suit against the Connecticut Glass Company, of Hartford, Conn., on the alleged grounds of infringement of a patent in making glass bulbs for incandescent lamps.

MOTOR OUTFIT COMPLETE.

The accompanying illustration shows a complete fan motor outfit, which possesses many desirable features. In the first place it is compact, requiring little space. The battery, as will be seen, is simple and consequently not liable to derangement, and the motor is the same in construction as the larger motors of the Knapp Electric & Novelty Co. The motor is 4 inches in height and starts itself when the current is turned on, and is said to develop greater power from the same source than any motor of the same size of any other make, and considering the smallness of the machine it is surprising what good results can be obtained from one cell of battery.



FAN MOTOR AND BATTERY.

One charge of the battery will supply current sufficient to run the motor for a few hours ; then a fresh charge can be easily put in and at very small cost.

The motor is fitted with a pulley so that toys and small machines may be operated, instead of the fan. The armature runs at a speed of 2,500 revolutions a minute. The fan that goes with this motor is 5 inches in diameter, and the battery is of the simplest character but very efficient.

The Knapp Electric and Novelty Co , 34 Warren street, New York City, is the manufacturer of these convenient and interesting little outfits.

TELEGRAPH DEPARTMENT.

The annual meeting of the stockholders of the Commercial Cable Company was held in New York City on March 20 and the following-named directors were elected : J. G. Bennett, A. B. Chandler, G. S. Coe, C. R. Hosmer, G. G. Howland, R. Irvin, Jr., J. W. Mackay, J. W. Mackay, Jr., E. C. Platt, T. Skinner, Sir A. D. Smith, W. C. Van Horne and G. G. Ward. The annual report for 1892 shows gross earnings of $1,890,377, and the net income increased $14,263 as compared with the previous year. Debenture bonds to the amount of $600,000 were redeemed on January 15 last, besides the payment of quarterly dividends of 1¾ per cent. each. It was decided to offer to the shareholders, for subscription at par, 19,290 of the 22,840 unissued shares for the purpose of providing the necessary funds for the laying of a third cable. Each shareholder will be entitled to subscribe for one new share for every four he now holds.

Well Deserved Promotion.—William J. Dealy, for many years past manager of the general office and superintendent of cable service in New York City for the Western Union Telegraph Company, was on March 30 promoted to be superintendent of the Company's commercial news and stock and race service. A. E. Sink, the present night manager, will be promoted to Mr. Dealy's place. The department of which Mr. Dealy takes charge is to be greatly extended.

Mr. E. F. Cummings has been appointed night manager of the Western Union Telegraph Co., New York City.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to electricity and kindred subjects, will find a place in this department. The publishers, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

INCANDESCENT WIRING OF DWELLINGS.

Will you kindly have some of your readers enlighten me as to the cheapest and best method of wiring a four-story dwelling without destroying the plaster and without exposing the wire any more than is absolutely necessary? The wiring is for incandescent lighting.

Yours truly,
"A Would-be Electrical Engineer."

THE BELL TELEPHONE PATENTS.

Can you tell me anything interesting concerning the telephone situation at the present time; that is, have other telephones differing in mechanism to the Bell Telephone, the right to be used, or not, and if not, why?

A. R. R., Charleston, W. Va.

THE WURT NON-ARCING LIGHTNING ARRESTER.

Replying to yours of March 23, in which your correspondent makes inquiry as to the form of Lightning Arrester mentioned in the paper I read before the National Electric Light Association, I would say, that this is the Wurt Non-Arcing Lightning Arrester manufactured by the Westinghouse Electric and Manufacturing Co., of Pittsburgh, Pa.

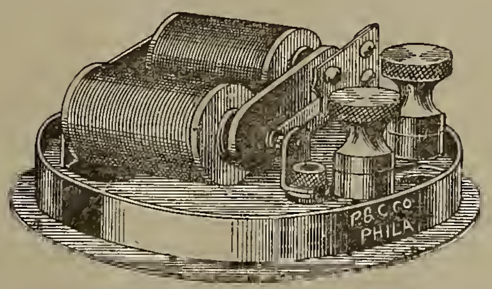
Yours truly,
R. H. Sterling,
Electrician, Denver Consolidated Electric Co.,
Denver, Col.

P. CLAUS & CO.

P. Claus & Co., 550-552 West 36th street, New York City, have installed in their new works about $30,000 worth of machinery, including 200 H. P. for testing purposes, and resistance for 1,000 amperes at 220 volts is already up. The large switchboard is equipped with Weston instruments for testing up to 1,000 amperes and 220 volts. They have one Ball automatic engine of 75 H. P., for special use and for testing purposes. Among the other machinery are four drill presses, fourteen lathes, two Garvin universal millers, two Bliss presses, two big shapers, a large planer, one boring mill to bore up to diameters of four feet and six inches. They are now finishing twenty dynamos with capacities from 60 to 600 amperes, among them being several of the Claus celebrated slow speed machines. These latter dynamos run at a speed of 250 revolutions, and generate a current of 350 amperes at 110 volts. Quite a force of winders and machinists are employed, and they are at present engaged in putting the heavy copper wire in shape on the armature for the 350 ampere, slow speed generator. Besides these other men are employed in the construction of Siemens and Gramme armatures, for the various dynamos made by the firm. The stock room is filled with dies, tools, etc., and the drafting department is completely fitted out with the necessary instruments and conveniences. The offices of the firm are located on the main floor of the building. This firm was started by Mr. Peter Claus not quite one year ago, and during that time it has grown from a small establishment at 357 West 41st street, in a room about 25 x 100, to its present proportions. Now the firm has three times the original space, and ten times more machinery and help, showing that the business has increased ten times compared with what it was at the start. This simply goes to prove that with diligent attention to business and first-class articles of merchandise, a large business can be built up however small the beginnings may be. Mr. Peter Claus is the general manager of the company, and is an electrical and mechanical engineer of experience. He is thoroughly conversant with the designing and building of electric light and power stations in every detail.

POCKET BUZZER.

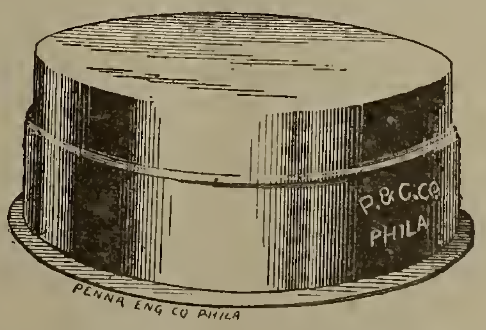
A testing instrument for the use of electric bell fitters and wiremen is obviously one that would meet with a large demand. Nothing of this particular class has yet been produced, but Partrick & Carter Co., of Philadelphia, have, with their customary enterprise and foresight brought out a little device that will unquestionably meet with much favor among the class of electrical workers above referred to.



POCKET BUZZER WITH COVER REMOVED.

The instrument is called the "Pocket Buzzer"—not because it buzzes in the pocket, but because it is small enough to carry in the pocket.

A buzzer is practically an electric bell shorn of its hammer and bell, the armature vibrating with a subdued noise which is by many preferred to the ring of a bell. These pocket buzzers are made entirely of metal and are nickel plated finish. They emit a clear, loud sound, and in spite of their diminutive size will answer very well for use in many places where larger buzzers are used. The illustrations accompanying this article show the buzzer with cover off and on, and they are full size. It will be readily seen, therefore, that it is very convenient to carry in the pocket. It is a very handy circuit tester, and it no doubt will greatly lessen the labors and save the time of electric bell fitters and wiremen.



POCKET BUZZER WITH COVER ON.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Alexandria, Ind.—A franchise has been granted to an eastern syndicate, represented by A. Runyan, for an electric road between this town and Anderson.

Attleboro, Mass.—The question of lighting the streets of this town by electricity is being agitated.

Columbus, O.—The legislature is to be petitioned for permission to issue bonds amounting to $250,000 for the purpose of establishing an electric-light plant for this city.

Erie, Pa.—The Keystone Electric Company has purchased a site on Twelfth street and will erect a new building 50x100 feet, and two stories high. The company has increased its capital from $25,000 to $50,000.

Georgetown, Del.—The residents of this town want the streets lighted by electricity.

Georgetown, Tex.—The question of installing an electric light plant in this town is being agitated.

Hamburg, N. Y.—A resolution has been passed empowering the village board to contract for 2,000 candle power arc lights at the lowest price per light possible. It is estimated that 25 or possibly 23 lights will be adequate for lighting the streets.

Hightstown, N. J.—The streets of this town are to be lighted by electricity.

Indianapolis, Ind.—It has been decided to instal an electric plant for the purpose of lighting the new freight houses of the Big Four railroad company which are not yet finished. Seven hundred and fifty incandescent and fifty arc lights will be needed.

New Paltz, N. Y.—At the corporation election it was voted to raise $900 by taxes to light the village by electricity the coming year.

North Brookfield, Mass.—It is said that an electric light plant will be installed here this season.

NEW CORPORATIONS.

Alexandria, Ind.—The Alexandria Electric Light and Power Company has filed articles of incorporation. Incorporators: James M. Barton, Cassius Greenlee, J. E. Jeffries, S. E. Young and A. E. Harlan.

Augusta, Me.—The Maine Railway, Light and Power Company has petitioned for incorporation.

Chicago, Ill.—Queen Electric Company. Capital $15,000. Incorporators: David A. Bennett, John F. Schaeffer and Henry G. Hinkle.

Consolidated Electric Company. Capital, $50,000. Incorporators: Lewis B. Scott, Charles P. Emmons and C. Oakamp.

National Electric Lamp Lighter Company. Capital, $50,000. Incorporators: Josephine C. Chambers, Philisky E. Stanley and Irving Culver.

The Sloss Electric Gas Lighter and Specialty Company. Capital, $50,000. Incorporators: Aaron M. Sloss, Louis Stein, and Sydney Stein.

The Preston Chemical Electric Company. Capital, $200,000. Incorporators: B. H. Ottinger, Henry W. Peck and Thomas J. Lesieur.

The Duplex Electric Trolley Manufacturing Company. Capital, $100,000. Incorporators: J. M. C. Tyner, P. L. Austin and E. P. Horey.

Concord, N. H.—The Mascot Water and Electric Supply Company has petitioned for incorporation.

Detroit, Mich.—The Superior New Automatic Light Company has been organized by J. R. McBrearty and others. Capital, $20,000.

Franklin, Me.—A petition has been made for incorporation by the Franklin Light and Power Company.

Housatonic, Mass.—The Housatonic Electric Light Company has petitioned for incorporation.

Jackson, Mich.—The Jackson Light and Power Company has filed articles of incorporation. Capital, 100,000. Incorporators: W. A. Foote, A N. Foote, J. B. Foote and John W. Allen, of Adrian.

Manchester, Conn.—A certificate of organization has been filed by the Manchester Light and Power Company.

Oxford, Me.—The Oxford Light and Power Company has petitioned for incorporation.

Spring Valley, Minn.—The Spring Valley Electric Light and Incandescent Company. Capital $50,000. Incorporators: B. F. Farmer, John Lenthold, G. M. Warren, S. C. Lobdill, E. W. Thayer, J. S. Lee, M. E. Molstead, J. B. Viall, T. A. Sorenson and D. A. Sullivan.

Stockton, Cal.—The Stockton Power Transmission Company. Capital $1,000 000. Directors: Louis Glass, H. J. Corcoran, Joseph Fyfe, I. S. Bostwick.

West Haven, Conn.—A petition for incorporation has been made by the West Haven Electric Power Company.

Augusta, Me.—Application has been made for incorporation of the Atlanta Shore Line Electric Railroad Company.

Boothbay, Me.—The Boothbay Harbor and Newcastle Street Railroad Company has petitioned for incorporation.

Buffalo, N. Y.—The Buffalo, South Shore and Hamburg Electric Railroad Company is being organized in the city by D. W. Allen and others.

The Buffalo and Niagara Falls Transit Land Company. Capital, $62,500. Directors: E. A. Kibbee, Mayville; Myron B. Dunham, Warren, Pa.; D. D. Dorn, Jamestown; Arthur A. Johnson, Buffalo and others.

Camden, N. J.—Articles of incorporation have been filed by the Electric Transit Company. Capital $100,000.

Chicago, Ill.—The Sterling Motor Company. Capital, $60,000. Incorporators: Sidney C. Eastman, Bowen W. Schumacher and Harry E. Pratt.

Concord, N. H—The upper Ammonoosuc Railway Company has petitioned for incorporation.

Fall River, Mass.—The Fall River and New Bedford Railway Company has been incorporated.

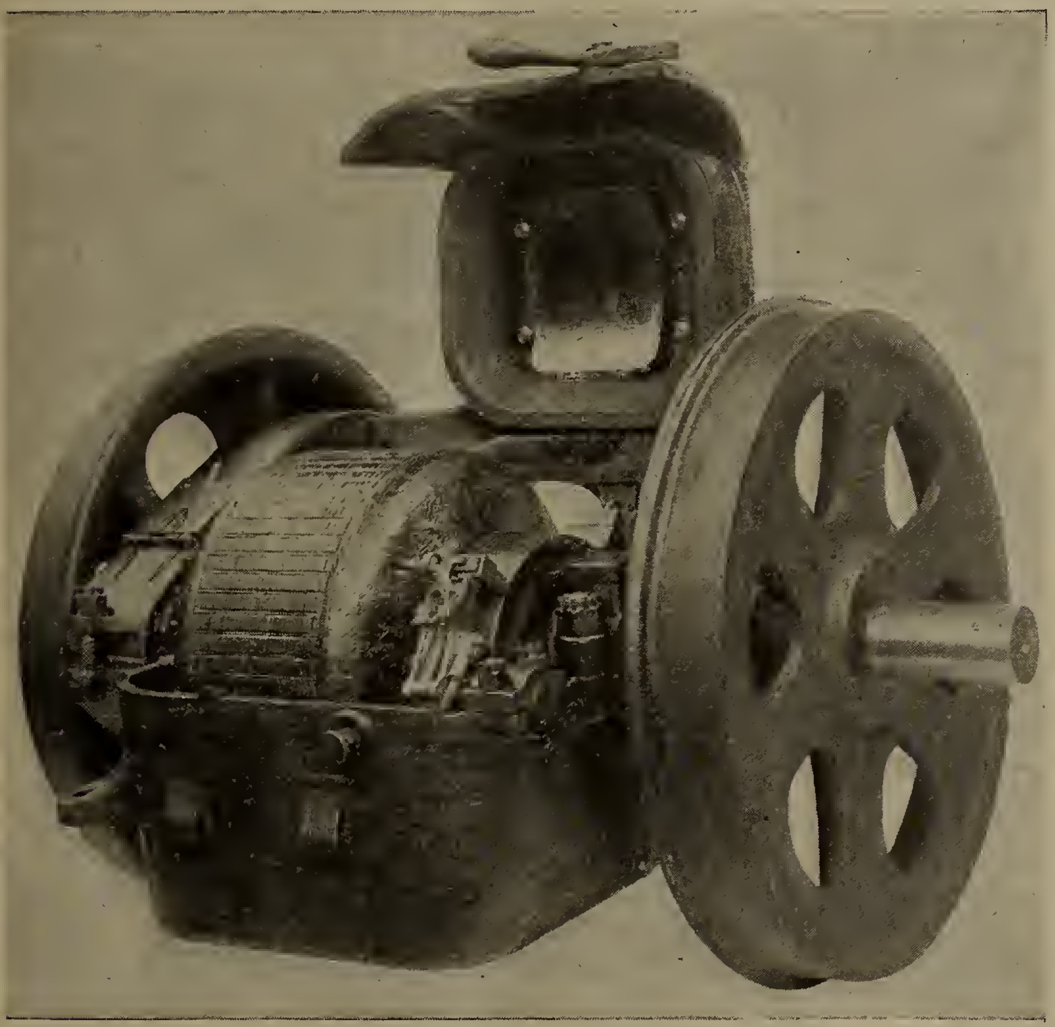
Geneva, N. Y.—The Geneva and Waterloo Street Railway Company has been organized. Capital $200,000. Officers: President, S. M. Hamil; Vice-President, Berry T. Miles, and Secretary and Treasurer, James F. Hughes

New Paltz, N. Y.—The New Paltz and Highland Electric Railroad Company has filed articles of incorporation. Capital, $90,000. Directors: William H. Price, Daniel A Hasbrcouk, Solomon Devo, John Schmid, George Rust, George E. Johnson, New Paltz; and Charles W. W. Arnold, Poughkeepsie.

Norristown, Pa.—The Chestnut Hill and Norristown Passenger Railway Company. Capital, $48,000. President, William H. Huelings, of Haddonfield, N. J.

MOTORS FOR NARROW GAUGE ROADS.

The needs of the narrow gauge railway have as yet escaped the close attention of the electrical companies. The General Electric Company, however, has recently designed and placed on the market a new type of single reduction motor, designed especially for use on tramways and other places where a narrow wheel gauge is desired. In general principle of design this motor closely resembles the standard W. P. type, with the exception that it has four poles, the two salient ones of which are top and bottom and the two consequent poles at the side of the frame. The armature, field spools, commutator, brushes and all the trimmings of the motor are entirely enclosed by the frame, and the armature bearings are so designed as to allow of only a bare clearance between the wheel of the truck and the sides of the motor. These motors are wound for either 200 or 250 volts, and are rated at about 250 pounds horizontal effort on a 20-inch wheel. The extreme outside width is only about 15¼ inches, so that the motor may be used on a road of but 18 inch gauge. The total weight of the motor with gear and gear case complete, is about 680 pounds.



MOTOR FOR NARROW GAUGE ROADS.

FINANCIAL NOTES.

A certificate filed at Albany by the Edison Illuminating Co , shows that its capital has been increased from $1,500,000 to $2,500,000 in accordance with the announcement made in a previous issue of the Electrical Age. The amount of the capital actually paid in is $1,500,000 and the liabilities of the corporation amount to $593,500.

The Louisiana Electric Light Company, of New Orleans, La., has given a mortgage to the Guarantee and Indemnity Company of New York for $2,000,000. The money is to be used in completing the construction and equipment of the company's plant and for providing means for future extensions, besides retiring $700,000 first mortgage bonds.

THE BRUSH ELECTRIC CO.

At the annual meeting of the Brush Electric Company, held in Cleveland, Ohio, March 21, 1893, the following named officers were elected for the ensuing year: W. H. Lawrence, President; John S. Bartlett, First Vice President; C. A. Coffin, 2d Vice Pres.; S. M. Hamill, Secretary; W. B. Bolton, General Counsel; B. F. Miles, Treasurer; S. M. Hamill, General Manager; A. B. Hough, Assistant Treasurer; L. B. Le Vake, Assistant Secretary; J. F. Hughes, Auditor.

THE SHORT ELECTRIC RAILWAY CO.

The annual meeting of the stockholders of the Short Electric Railway Company was held in Cleveland, Ohio, on March 22 last, at which the following named officers and directors were elected for the ensuing year: President, B. F. Miles; Vice President, S. H. Short; General Counsel, W. B. Bolton; General Manager, S. M. Hamill. Directors: S. H. Short, W. H. Lawrence, M. T. Herrick, W. B. Bolton, B. F. Miles, James Parmelee, S. M. Hamill.

NEW TELEPHONE COMPANIES

The Chicago Twin Wire Long Distance Telephone Company, Chicago, Ill., has filed articles increasing its capital from $2,500,000 to $5,000,000.

E. D. Kelly, of the Abilene Electric Light and Power Company, Abilene, Tex., has organized a telephone company, and it is said that the exchange will be ready for business July 1.

NOTES OF GENERAL INTEREST.

William A. Godfrey, a lamp trimmer in the employ of the Municipal Electric Lighting and Power Company of St. Louis, was killed instantly by electric shock, on March 22. He was trimming a lamp, and in some way the current passed through his body with fatal effect. Godfrey was 21 years old.

Mr. Milton F. Adams recently gave a very successful exhibition of the Edison phonograph at the Drexel Institute, Philadelphia. A large audience was present and great enthusiasm was evinced. A few evenings later he entertained the members of the Clover Club. Mr. Adams left in his wake a very favorable phonographic sentiment.

It is reported that Mr. A. D. Claflin, of the Mather Electric Company, Manchester, Conn., has made arrangements to manufacture an incandescent lamp which does not infringe the Edison patents. The lamp, it is said, hails from Chicago.

Dr. Berens, Chairman of the Cup and People's Regatta Committee for 1893, of the Undine Barge Club, Philadelphia, proposes to equip an eight-oared shell with a propeller to be operated by electricity. The American Electro-Dynamo Company, of Philadelphia, has secured the contract to make the experiment, and work on the same will be at once started. The electric shell is to be used by the referee in going over the race course.

The Tiffin, Ohio, electric railway had been in operation but one day when it had to shut down for a week in order that the foundations of the engines in the power house might be strengthened. They were weakened by the recent destruction by fire of the electric light works.

It is reported that the General Electric Company is considering the question of moving its machine works from Schenectady, N. Y. The object is to obviate a repetition of the disasters of the recent floods of the Mohawk river. Several cities are talking and working, each with the object of having the "lightning" strike it when the General Electric Company decides to look about for a new location.

An electric light wire fired the Railroad Y. M. C. A. building in Troy, N. Y., on March 22, causing a loss of about $1,000.

The Denver Tramway Company of Denver, Col., has extended its line to the Riverside Cemetery, and is now chartering funeral cars. The distance to the cemetery is so great that this innovation meets with much favor, and it is proposed to extend like facilities for reaching Fairmount Cemetery.

The station of the McKeesport Electric Light Company, McKeesport, Pa., was destroyed by fire on March 31. Loss $100,000.

NEW BOOKS.

The Measurement of Electrical Currents, and Other Advanced Primers of Electricity. By Edwin J. Houston, A.M. New York: The W. J. Johnston Company, Ltd. 429 pages, 169 illustrations. Price. $1.00.

Electrical Measurements and other Advanced Primers of Electricity is the second volume of Professor Houston's series of elementary electrical treatises for students and non-technical readers. A third volume will complete the series, but there is no necessary connection between the several volumes, each one being complete in itself as are the several primers in each volume, as far as possible.

The book derives its title from the first three primers, which relate to the measurements of electric currents, electromotive forces and resistances, respectively. The object of these primers is not so much to teach the practical operations of electrical measurements, as to explain in simple but exact terms the principles and apparatus upon which they are based.

Two primers are on voltaic and thermo-electric cells and other sources of electricity. The principles upon which commercial currents are based are explained in three primers, and nine others are devoted to the principles and applications of dynamos, motors and transformers, the eighteenth and last primer being a review or primer of primers.

The two hundred and odd pages on electric lighting and power deal very thoroughly with the different methods and apparatus in practical use. This section will be particularly welcomed by the large class of intelligent readers who desire to obtain a correct knowledge of the applications of electricity and it will also, from the author's careful exposition of principles, be of marked value to electricians and students.

Large Contract.—It is stated that the Atlantic Avenue Railroad Company, of Brooklyn, N. Y., has made a contract with the Westinghouse Electric and Manufacturing Company for car equipments and generators, at a cost of $1,000,000.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, April 1, 1893.

A couple of subway explosions occurred on March 22 uptown, which were caused in a rather curious way. On the night of March 21 Second avenue and Eighty-fifth street were lighted by electricity for the first time, the wires running in the subways. The consequence was a material falling off in the consumption of gas, which caused an unusual pressure in the gas mains. A leak resulted and the escaping gas found an entrance to the subway. In some way this stray gas became ignited, with the result of blowing the cover off the man-hole at the corner of Eighty-fifth street and Second ave. skyward. No one was hurt, however, and little damage was done to the surrounding pavement. An hour later another explosion occurred, this time at the corner of 63d Street and Second avenue, but no damage was done.

The Interior Conduit and Insulation Company, 44 Broad street, is operating a car on the Brooklyn and Coney Island Railway equipped with a Lundell motor. A 25-horse-power motor is used and the power is transmitted to the axles by means of a sprocket chain. It is said that the car is working very successfully.

Col. Burnham, of the Electric Gas Lighting Company, Boston, was found wandering among the supply houses in this city this week on business bent.

The Caterer is the name of a new publication in the interests of hotel proprietors and restaurant keepers. It is published in this city at 11 East 14th street, and is in magazine form. It is well printed and edited and its first number contained an article entitled "Electricity an Ideal Fuel." Mr. J. T. Burgess is the editor, and F. W. Doolittle, business manager.

Mr. Walter P. Phillips, general manager of The United Press, has been elected as secretary of the Lotos Club of this City. Mr. Phillips is an old telegraph and newspaper man, and is well known to a great many of our readers.

Mr. H. H. Harrison, of 29 Broadway, City, has taken the agency for W. T. C. Macallen's solid mica insulation railway specialties. Mr. Harrison is not now representing the General Electric Company. All railroad material buyers should see him before placing their orders.

Mr. R. D. Nuttall, of the R. D. Nuttall Co., Allegheny, Pa, and Mr. McGinly of the same company, were in the city this week. Mr. McGinly stopped at the Imperial, and Mr. Nuttall at the Marlborough.

Mr. Ernest A. Lowe, manager of the supply house of J. Jones & Son, 39 Vesey street, city, is the right man in the right place. Through his enterprise, his firm is doing a large business in general electrical supplies and specialties.

Mr. Robb McKie, ex-electrician of Cincinnati, Ohio, has accepted the position of electrical engineer of the C. & C. Motor Co., of this city.

A. Aller, dealer in engineering specialties for steam, oil, gas, water and chemicals, 109 Liberty street, city, has just issued a fully illustrated catalogue of the great variety of goods dealt in by him.

W. T. H.

The Electrical Age's Illustrated Record of Patents.

Issued March 28, 1893.

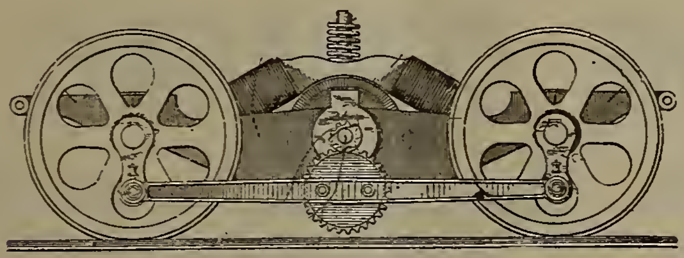
494,185. Printing Telegraph. Joseph E. Wright, New York, N. Y. Filed Nov. 16, 1892.

494,186. Ligtning-Arrester. Alexander Wurts, Pittsburgh, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Jan. 14, 1892.

494,199. Pyroelectric Battery. Thurston G. Hall, Chicago, Ill., assignor to the Hall Chemical and Gas Company, same place. Filed March 8, 1892.

494,225. Electrical Meter. Gustaf Rennerfelt, Buffalo, N. Y. Filed April 1, 1892.

495,231. Treatment of Metal Plates Prior to Electrolysis. Charles B. Schoenmehl, Waterbury, Conn., assignor of one-half to Alden M. Young, same place. Filed April 11, 1892.



494,478—DRIVING GEAR FOR MOTORS.

494,232. Apparatus for Electrolyzing Copper. Charles B. Schoenmehl, Waterbury, Conn., assignor of one-half to Alden M. Young, same place. Filed April 11, 1892.

494,239. Electrical Excitation of Vacuum-Tubes. Harry T. Barnett, London, England. Filed Feb. 5, 1892. Patented in England.

494,278. Electric Bell. Frederick W. Manger and Otto H. Huebel, Brooklyn, N. Y. Filed June 8, 1892.

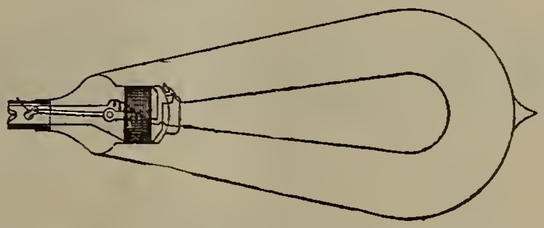
494,279. Circuit of Electrical Signaling. Morris Martin, Malden, Mass., assignor by direct and mesne assignments to the United States Electric Fire Signal Company, of Maine. Filed July 14, 1890.

494,286. Apparatus for Protecting Buildings from Lightning. Jonathan B. L. Bartlett, Boston, Mass. Filed Oct. 31, 1892.

494,291. Electric Heating Apparatus. Mark W. Dewey, Syracuse, N Y., assignor, by mesne assignments, to the Dewey Electric Heating Company, same place. Filed Mar. 24, 1892.

494,295. Induction System of Electrical Heating, Samuel B. Jenkins, Boston, Mass., assignor to the Butterfield-Mitchell Electric Heating Company, same place. Filed May 28, 1892.

494,301. Electrically-Heated Radiator. Willis Mitchell, Malden, assignor to the Butterfield-Mitchell Electric Heating Company, Boston, Mass. Filed June 8, 1892.



494,531—ELECTRIC LAMP VIBRATOR REGULATOR.

494,337. Electric Annunciating Push-Button. John King, Chicago, Ill. Filed June 24, 1892.

494,344. Controlling Device for Electric Cars. James H. Neal, Boston, Mass. Filed Dec. 30, 1891.

494,345. Electric Signaling Apparatus. Frederick Pearce, New York, N. Y. Filed Nov. 2, 1892.

494,348. Electric-Lamp Support. Charles E. Richardson, Springfield, Vt. Filed Nov. 16, 1892.

494,359. Electric Brush. Robert E. Williams, Hot Springs, Ark., assignor of one-half to Charles W. Israel, Paris, Ill. Filed Nov. 29, 1892.

494,385. Telephone and Signaling Circuit. Frank A. Pickernell. Newark, N. J., and Francis W. Dunbar, New York, N. Y., assignors to the American Telephone and Telegraph Company, of New York. Filed Dec. 15, 1892.

494,451. Electrical Switch Lock. Frederic C. Weir and Edward W. Harden, Cincinnati, Ohio; said Harden assignor to said Weir. Filed Dec. 20, 1892.

THE

"CLARK" WIRE.

TRADE MARK.

"CLARK" WIRE.

Insulation Guaranteed wherever used, Aerial, Underground or Submarine.

In a letter from the Inspector of the Boston Fire Underwriters' Union, he says:

"A thoroughly reliable and desirable Wire in every respect."

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PATENTS.—Continued.

494,477. Electric Railway. John C. Henry, New York, N. Y. Filed Aug. 19, 1890.

494,478. Driving-Gear for Motors. John C. Henry, New York, N. Y. Filed Dec. 12, 1891.

494,479. Electric Car-Truck. John C. Henry, New York, N. Y. Filed Jan. 2, 1892.

494,489. Electric Signal, Switch Moving, and Interlocking Mechanism. Joseph Ramsey, Jr. and Edward W. Harden, Cincinnati, Ohio, assignors to Frederic C. Weir, same place. Filed Aug. 13, 1892.

494,495. Electric Bolt-Operating Mechanism for Safes. Emory Stockwell and Herbert C. Stockwell, Stamford, Conn., assignors to the Yale & Towne Manufacturing Company, same place. Filed July 11, 1892.

494,499. Globe-holder for Electric-arc Lamps. William A. Turbayne, Detroit, Mich., assignor to the Liggett, Turbayne & Company, same place. Filed July 1, 1892.

494,513. Alternating-Current Meter. William Stanley, Jr., Pittsfield, Mass. Filed Aug. 11, 1892.

494,520. Electrical Instrument for Medical Purposes. Benjamin Y. Boyd, Wichita, Kans. Filed Dec. 15, 1892.

494,525. Block-Signal System for Railways. Eugene Fontaine, Detroit, Michigan, assignor to the Fontaine Safety Signal Company, same place. Filed July 11, 1892.

494,531. Electric-Lamp Vibrator-Regulator. Daniel M. Moore, New York, N. Y. Filed Nov. 23, 1892.

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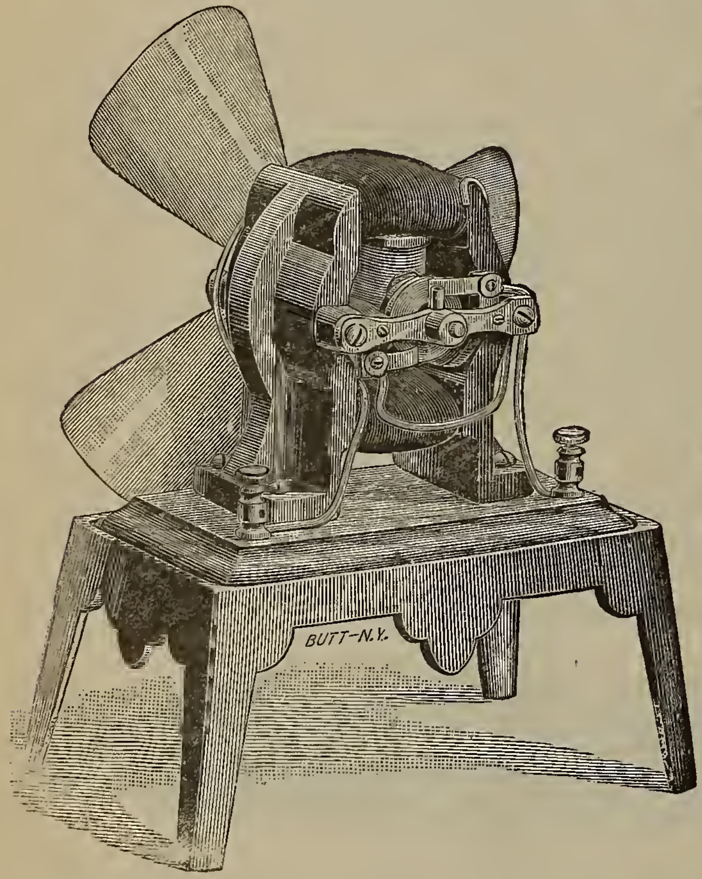

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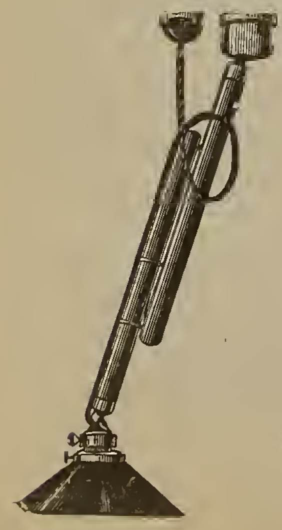

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NEW YORK, APRIL 15, 1893.

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NEW TRANSFORMER.

The type of transformer described elsewhere in this issue, just brought out by the General Electric Company, seems, by the tests made of it, to possess to a high degree all the essential qualities of a reliable and highly efficient transformer. It combines safety, high efficiency, good regulation, small core loss and convenience of installation. Oil is used as insulation in addition to the usual methods, tests showing that the transformer is capable of withstanding a very high pressure. The value of oil as an insulator was conclusively proved by these tests. A difference of potential of 11,000 volts was reached before the insulation between the coils yielded, and 5,000 volts were applied before the insulation broke down the second time. There are several new features about this transformer that will attract the attention of electrical engineers.

ELECTRICAL EXECUTION.

At 11:10 A. M., Monday, April 3, James L. Hamilton, colored, was put to death by electricity at Sing Sing prison. The current (alternating) was of 1,740 volts when first turned on and diminished to 150 volts, according to the new method of its application. The execution was successful in every particular, and there was no mark whatever on the body to indicate the manner of death. It is thought the victim was killed by the first shock. The current was on one minute.

TROLLEY MAIL CARS.

The idea of adapting electric street cars to local mail service in large cities seems to be extending. In Cleveland, Ohio, preparations are being made to introduce electric mail cars on the street railroad lines in order that the mail matter to and from the outlying sections of the city may be more expeditiously delivered and collected. The idea is to carry mail clerks on each car who will work on the car while it is in motion, instead of at the office. It is obvious that a great saving of time will be effected, and the needs of business in large cities demand better and quicker facilities for handling mail matter. St. Louis has tried the experiment and found it very convenient, and there is no reason at all why the idea should not be adopted in all large and enterprising cities. Even if rapid transit cannot be carried out to its limit on account of crowded streets, time would be saved by running mail cars and the work of mail assorting, distribution, etc., carried on *en route.*

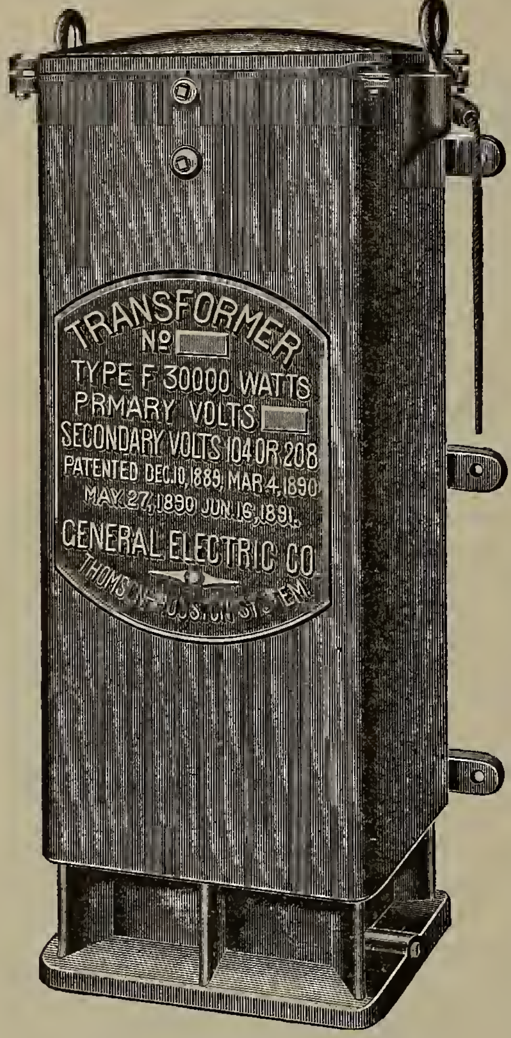
THE VALIDITY OF THE BERLINER PATENT.

The uncertainty regarding the legal status of the Berliner telephone transmitter patent is directly involved in a question between the Bell Telephone Company, of Philadelphia, and a Philadelphia business house. The facts in the case are briefly recorded on another page of this issue. If the matter gets beyond the hands of the parties concerned into the courts, the patent referred to will undoubtedly form the basis of the contention ; it may not be in name but it will be in fact. The firm in question constructed a telephone system in its factory for its own use for the purposes of communication between office and factory, when an inspector for the Bell Telephone Company, of Boston, came along and stated that the firm must either pay royalties to the Telephone Company or answer in a suit. This demand on the part of the Bell Company was, it is reported, made on the basis of the Berliner patent, and in view of the fact that the annulment of this particular patent has been asked for in the courts, the patent would seem to be rather uncertain ground upon which to base a fight for infringement or the payment of royalties.

THE GENERAL ELECTRIC COMPANY'S ALTERNATING SYSTEM OF LIGHTING.

The use of the alternating system for incandescent lighting, has within the past few years made immense strides, so much so, indeed, that it is fast advancing on the record made by the direct current system. This is, perhaps, chiefly due to the high state of perfection to which the apparatus for lighting by the alternating current has been brought by careful research and experiment as well as to the skill displayed in installation.

Next to the generator itself the transformer may be said to play the most important part in the system. It is the means whereby the current of high tension, generated at the central station, may be converted into one of low tension suitable for the operation of the ordinary incandescent lamps. On its efficiency depends to a great extent the profits of the station; and it is the protecting device between the station and the consumer.



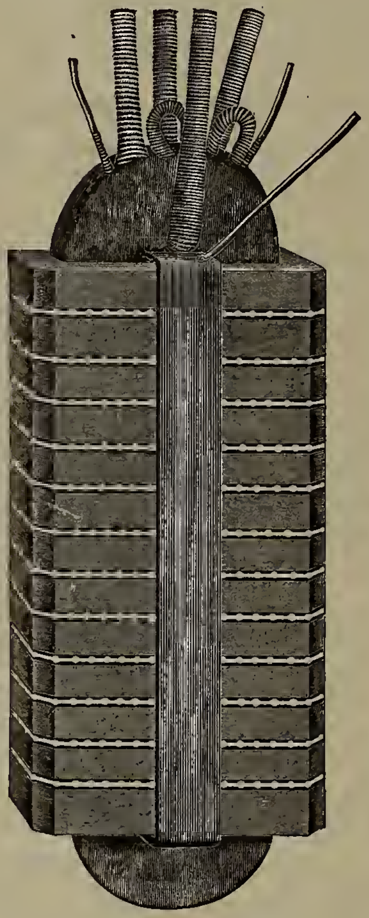
30,000 WATT TRANSFORMER.

Almost from the time of its introduction, the transformer has been an efficient device, but it has required years of practice to make manifest its shortcomings, and numerous experiments in order to successfully overcome them.

In this work the General Electric Company may be said to have done yeoman's service. It has brought the transformer to a pitch of excellence never before attained in this country or in Europe.

The essential characteristics of a good transformer are perfect safety, high efficiency, good regulation, small core loss and convenience of installation. In the "F" Type of General Electric Company transformers, perfect safety is attained by insulating by the best mechanical means; by the use of oil as an additional insulation; by the provision of a core ground wire; by the sub-division of the primary and secondary coils, and by the absence of all fuses in the transformer case. The additional insulation given to the transformer by the use of oil renders its insulation as nearly perfect as human ingenuity can devise. For the case being filled with a high grade of mineral oil, the coils and core are entirely immersed, with the result that should the lightning strike one of these transformers, and injure the insulation in any way, the oil would immediately flow in and restore the apparatus to its original condition. These oil filled transformers have been subjected to numerous stringent tests, and it has been found necessary to increase the potential to more than 11,000 volts alternating before the insulation between the coils could be broken. After allowing the apparatus in which the insulation had just been broken by this high potential to stand a short time, the test was again applied, and not until the potential had been increased to over 5,000 volts alternating did the insulation give way the second time. The value of oil, as an additional insulator may, therefore, be said to have been conclusively proved.

The core ground wire serves to render the transformer still more mechanically efficient, for should lightning break through the insulation or the primary coil it is carried at once to the earth by the core wire which should be carefully grounded. Furthermore, the primary coils are themselves subdivided. By this means, the greatest difference in potential existing between any two parts of the primary and secondary windings is only half the primary voltage, the secondary winding being the nearer to the core.



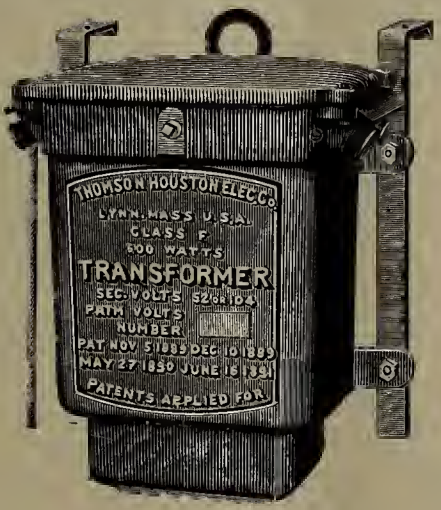
INTERIOR OF 30,000 WATT TRANSFORMER.

The absence of fuses in the transformer case obviates the necessity of opening the case, and eliminates whatever danger might be caused by the molten metal of the blown fuse. The fuses, in a separate box, non-combustible and waterproof, together with the primary switch, are placed in an easily accessible position, thus allowing of the regulation of the transformer to one free from disturbance. The fuses are covered with rubber tube, and it has been shown by actual test that where a certain potential will form and hold an arc in the open air across a space of seven inches, the use of tubing hinders the formation of an arc under the same potential, even across the small space of one and three-quarter inches. On systems using potentials of over the regular 1,046 volts, two single pole boxes are employed.

The efficiency obtained in this transformer has been shown by exhaustive tests to be as high if not higher than any yet obtained, and an excellent average at all loads. It will be seen by the following table that the larger the transformer, the greater is its efficiency :

Watt Capacity.	¼ Load.	½ Load.	¾ Load.	Full Load.
600	84.1	90.95	93.	93.8
1,000	88.2	93.	94.	94.7
1,500	90.	94.	94.95	95.23
2,500	90.25	94.32	95.45	95.74
3 500	93.0	95.7	95.8	96.
4,500	93.9	96.3	96.85	96.96
7,500	92.2	95.8	96.4	96.85
15,000	91.5	95.3	96.3	96.5
30,000	93.3	95.9	96.8	97.2

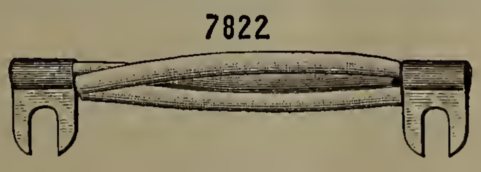
Practical uniformity of potential on the secondary winding throughout the range from full load to light load, is the test of regulation of a transformer, for the difference of only a few volts on the secondary winding from the normal means either unsatisfactory light or a shortening of the life of the lamp. It is to this point that the General Electric Company has given much attention with the result that its transformer gives no greater drop in potential than that shown in the following table :



SMALL TRANSFORMER.

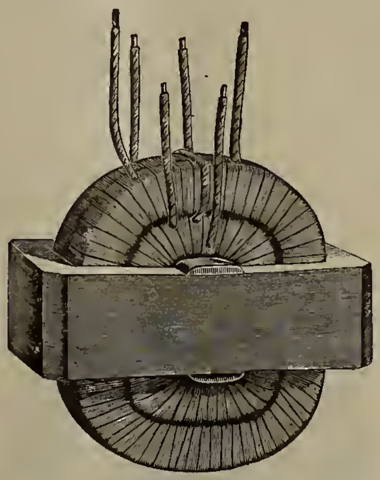
Transformer.	52 Volt Secondary.	104 Volt Secondary.
Capacity in Watts......	600, 1,000, 1,500 2,500, 3,500, 4,500. 7,500	15 000 30000
Drop of Potential in Volts................	1,09, 1.211.95, 1.43, 1.5 1.5 1.6.	3. 3.

Core loss is an element more or less present in transformers of what make soever, due to hysteresis, or molecular friction due to rapid reversals of polarity, and Foucault or "eddy" currents. Its elimination is a problem which presents considerable difficulties, and, although it is almost impossible to prevent the loss entirely, yet the high efficiency of the apparatus under consideration shows that that loss is extremely small.



FUSE.

The tendency of present practice is the substitution of a few large units for a large number of small ones, at points having a sufficient number of lights to warrant this step. This marks the abandonment of the idea that the transformation of a large amount of electrical energy in one large piece of apparatus is less reliable and more dangerous than that made by means of a number of smaller pieces. The excellence of construction of the larger devices has served to dispel this idea, and the larger transformer is undergoing steady and rapidly extending adoption. The larger transformers constructed by the General Electric Company are designed for a transformation of 15,000 and 30,000 watts. Their size necessitates a subdivision of winding. In the 15,000 watt transformer both the secondary and the primary coils are each subdivided into two parts ; in the 30,000 watt transformer the primary winding consists of three and the secondary of two separate coils. By this means satisfactory regulation is obtained. In these, as in smaller sizes of transformers, provision has been made for a perfectly free circulation of the insulating oil about the different coils. The larger sizes have no connection boards, the terminal wires being brought out at the top of the case for connection through suitable switches and fuse boxes to the primary and secondary wires.



INTERIOR OF SMALL TRANSFORMER.

The illustrations show the method of construction of the transformers. The laminated core is securely fastened into the iron case by means of wooden wedges, which serve as insulation between the coils and the case. The cover to the case is slightly arched and flanged in order the better to protect the interior from mechanical injury. Each transformer is subjected to an insulation test of 5,000 volts before it is allowed to leave the factory.

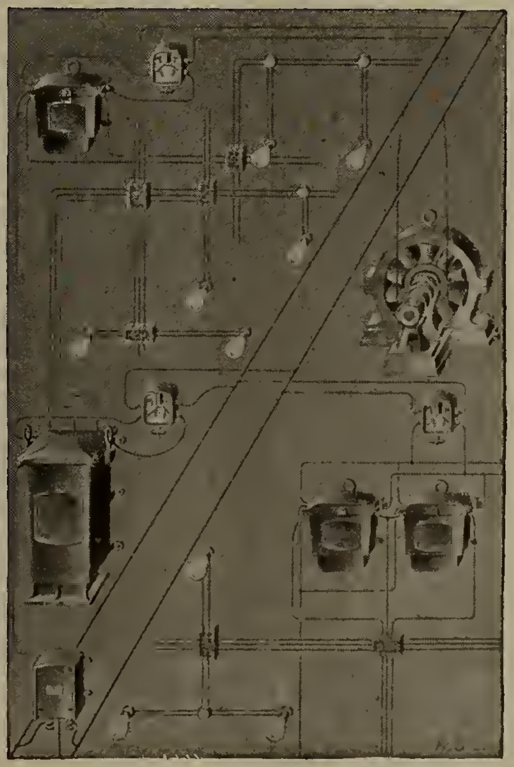
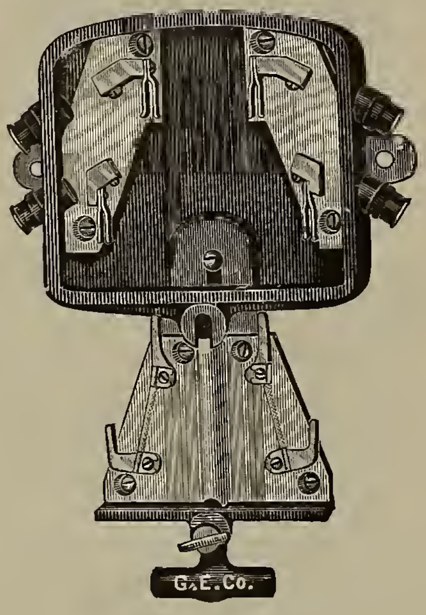


DIAGRAM OF TRANSFORMER INSTALLATION.

The advantages derivable from the use of large transformers are numerous. Small transformers in parallel are apt, from various causes, to give trouble by unequally dividing the load between them; and the combined efficiency is always less than that of the single transformer equal to their aggregate capacities. From a large transformer a three-wire system may be operated directly from its secondary terminals. But few people appreciate the advantage of using a high potential on the secondary winding where a large number of lamps are to be installed at one point; and yet this can be shown as follows:

With 500 lights installed on several transformers in parallel, having a potential of 50 volts on their secondary wires, there is a drop of potential in the secondary system from no load to full load of about 6 per cent. The substitution of a large transformer, with its secondaries connected for 104 volt lamps on the three-wire system will reduce the drop in potential from 6 per cent. to about one-half of 1 per cent. This drop is far less than is necessary for satisfactory operation and it is, therefore, possible to install the system for less than one-half the cost of wire of a system with small transformers using a 52-volt potential and 6 per cent. drop.



SWITCH BOX.

The operation of electric lights, or motors at a considerable distance from the source of power has rendered necessary an even higher development of the transformer in order that transmission of the power by electricity may be economically accomplished.

The system of long distance transmission as employed by the General Electric Company is that of using generators, which give a potential of about 1,000 volts, and large transformers adapted to raise the potential to 5,000 volts or higher. The current thus transformed is transmitted over wires, supported upon oil insulators, to the distant receiving point, and is there retransformed to an easy operable potential.

The line insulators employed consists of a wineglass cup with an inner flange which dips into a ring-shaped, glass oil cup threaded on to the insulator pin. This construction effectually prevents any leakage of current from the wire to the supports, even in wet weather.

The transformers are the same as the standard type "F" transformer, except in the method of winding and insulating the coils.

The use of oil in this long distance transmission apparatus is considered extremely desirable, because of the high potential of the "step up" circuit; and the protection it affords against injury to the insulation of the coils can not be over-estimated.

Both the primary and secondary coils of the long distance transformers are so wound as to secure the greatest possible inductive effect without any sacrifice of insulation. Mica is freely used, and the greatest care is taken both in winding and assembling to make the insulation as perfect as possible. This insulation is in all cases tested to withstand an alternating potential difference of at least 10,000 volts The transformors are alike, with the exception of a modification in the winding, whether intended for "step up" or "step down" work, the primary of the "step up" corresponding to the secondary of the "step down." The standard size is 25,000 watt capacity, and larger sizes will be built if desired. It is not considered advisable, however, to build smaller sizes than this.

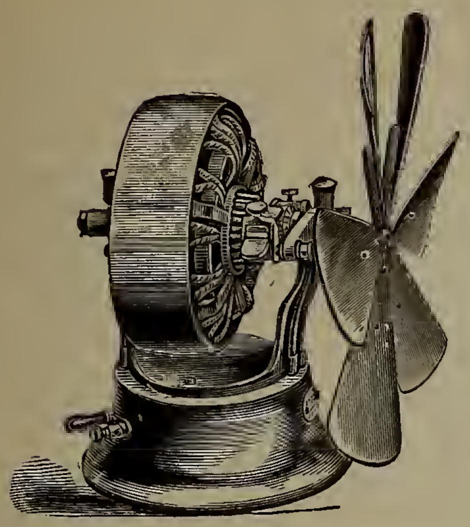
ELECTRIC DISCHARGE THROUGH RAREFIED GASES.

Exceedingly beautiful effects are produced when the discharge from an induction coil is passed through rarefied gases or vapors. These phenomena are best studied by means of Geissler's tubes. These tubes are made of glass, having a platinum wire fused through each end the outer portion of which is made into a small loop, while the inner passes into the tube and sometimes terminates in aluminum-foil electrodes.

If the tube, before exhaustion, is connected with the secondary of an induction coil, no effect is produced, because the air offers too great a resistance to allow the discharge to pass. As the air is gradually removed by means of a Sprengel's air-pump, the resistance diminishes, until, when the pressure has fallen to about an inch of mercury, a feeble discharge begins to pass through the tube, becoming first visible as a faint glow near the terminals. As exhaustion proceeds this luminosity gradually increases, and long thin undulatory threads of light extend from terminal to terminal until, gradually expanding, they form one luminous column, which begins at the positive terminal and reaches to within a short distance of the negative one, the latter terminal being surrounded with a bright glow. After this stage is reached the long positive column begins to divide into numerous thin distinct discs or cuplike patches of light known as *striæ*, having their convex sides facing the negative pole. These gradually increase in size and move further from each other. Meanwhile the negative glow has separated slightly from the surface of the terminal, leaving a sharply defined dark space which enlarges as exhaustion proceeds. When this dark space is about half an inch in diameter the glow around it becomes indistinct both in outline and luminosity while the striæ diminish in number and sharpness of outline, but increase in thickness. As the exhaustion proceeds, the column of striæ shortens, receding from the negative end, and fades in brilliancy until only a few indistinct remnants are left near the positive terminal. These at length disappear and the whole tube is now comparatively dark. If, however, exhaustion be carried still further new phenomena appear. The tube itself, if made of German glass, becomes brilliantly luminous with a yellowish-green phosphorescent light. At this pressure a number of interesting results, chiefly discovered by Crooks, may be obtained. Lime, chalk, alumina, diamond, ruby and many salts and minerals when placed near the negative pole in such a vacuum shine with a phosphorescent light of various colors, the emitted light in certain cases giving a characteristic spectrum.

At a very early stage in the exhaustion different gases give different colors; *e. g.* coal gas is green; air or nitrogen, pink, with a very bright violet glow around the negative electrode; carbon dioxide, white; hydrogen, blue in a wide tube; crimson in a narrow one; but all these colors decrease in brilliancy as the exhaustion proceeds, approximating more or less to a whitish tint.

DIEHL ELECTRIC FANS.



As the season for the use of electric fans is approaching a few words concerning a make of apparatus of this class which is rapidly growing in favor will not be out of place.

Every one knows that the hot season is robbed of all its terrors when an electric fan is available, and electric power is so easily obtained nowadays and electric fans are so reasonable in cost that there is little excuse for permitting ourselves to roast, stew and otherwise submit to other cooking processes during the summer time.

The particular fans we propose to refer to in this article are those manufactured by Diehl & Company, of 385 Broadway, New York City. These fans have achieved success everywhere.

The electric motor which supplies the driving power for the fan is contained within the basket, and to the wheel which encases the revolving armature, the blades are attached. The spindle revolves on a roller bearing within a tight oil cup, and the wires pass up through the tubing. The mechanical construction of this compact motor is first-class, and the electrical efficiency of the machine is said to be high. It can be operated on a direct, incandescent or arc current with equal success, and is wound for 110 volts or under. These fans can be effectively operated in series on a 220 volts or 500 volts street railway current, thus rendering their use by street railway companies, a matter of no difficulty whatever. They are ornamental in appearance and are finished in polished brass, nickel or japanned designs.

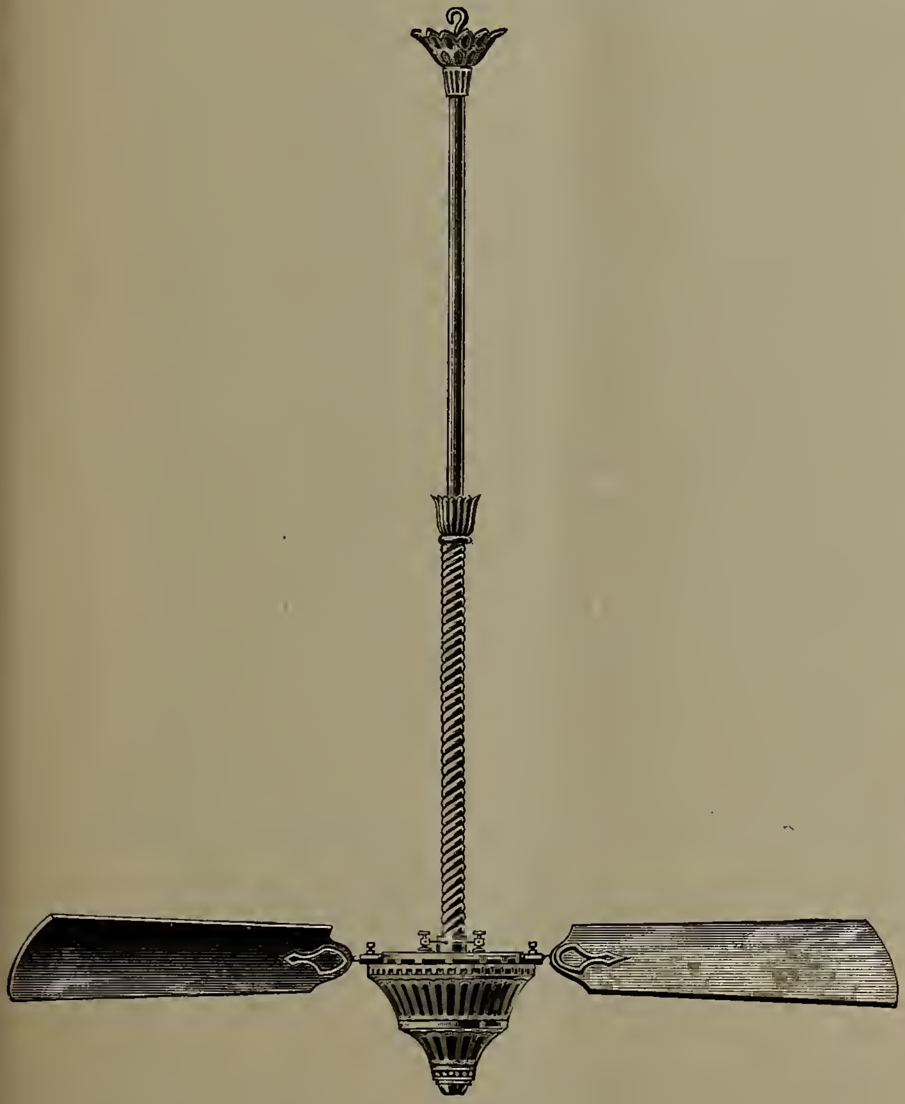


FIG. 2

The accompanying illustrations show some of the various forms of fans made by the Diehl company.

In Fig. 1 we have a view of a ceiling fan of very ornamental design. It is made of highly polished brass, and intended for use in parlors, offices, or in other similar places where it is necessary to preserve the harmony of the surrounding furnishings.

In rooms with high ceilings the fan shown in Fig. 2 is excellently adapted. It has an adjustable tube, enabling the lowering or raising of the fan at will. It is finished in nickel and japan.

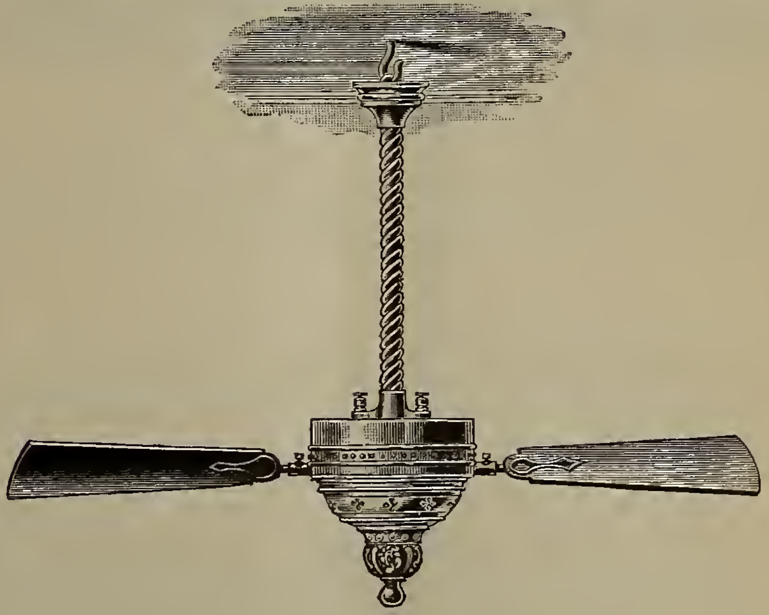


FIG. 1.

It is not always desirable to hang fans from the ceiling, and to provide for conditions of this sort the floor column fan, shown in Fig. 3 is designed. This fan is attached to the floor, is very handsome in finish, and is not adjustable, as is the last one referred to. A floor fan is in many places preferable to ceiling fans and this device fills all the requirements perfectly. A shorter fan of this design is also made for counters in stores, etc.

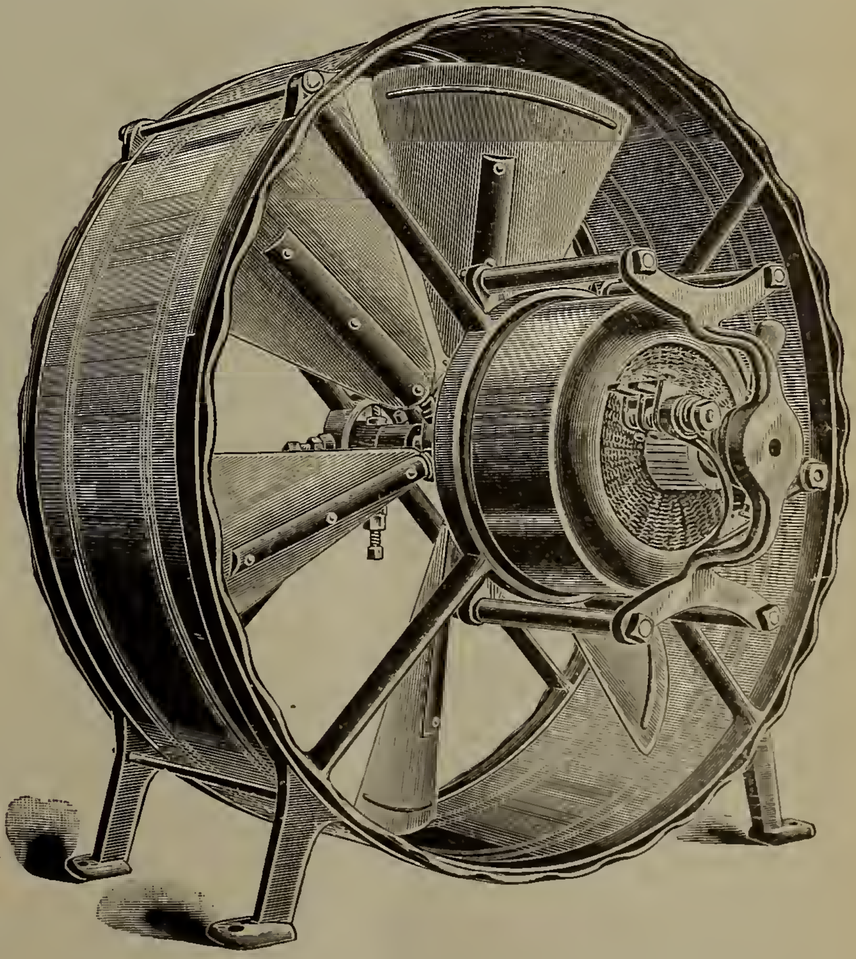


FIG. 4.

Propeller fans are frequently preferred to either ceiling or column fans, and for this trade the apparatus shown at the head of this article is designed. It has the highest efficiency and gives a horizontal breeze which is a delight in warm weather. The apparatus, it will be seen, is very compact.

Fig. 4 shows a view of a Diehl Electric Motor and Disc Fan Combination which is an excellent apparatus for heating, ventilating and cooling rooms. The fan and armature shafts are one and the same, and the fan is consequently driven at a very rapid speed. These fan combinations do not obstruct the light and are practically noiseless in their operation. They require minimum power for driving them.

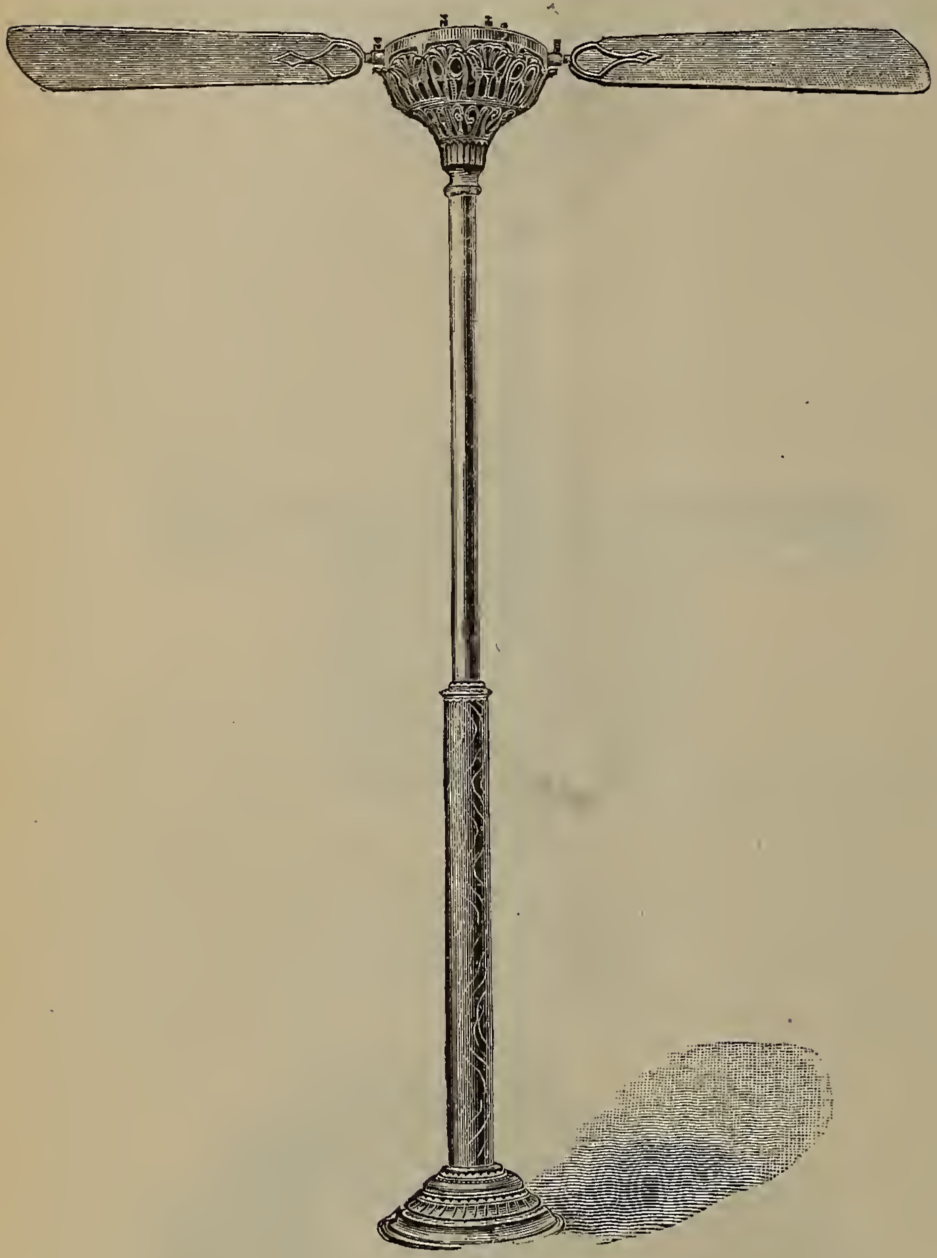


FIG. 3.

THE TELEPHONE PATENTS.

As far as is now known the first test of the question as to the validity of the Bell telephone patents has been brought about by a Philadelphia firm erecting and operating a telephone system for its own use. The firm is that of Kohn, Adler & Co., No. 722 Market street. They put up a telephone system in their building, connecting their offices with their workshops in the upper stories. Soon after its completion a person, who represented that he was the inspector of the Bell Telephone Company, of Boston, notified the firm that unless a royalty were paid to the home company suit would be commenced for damages.

On questioning the inspector Mr. Kohn elicited the information that the Bell Company made the demand on the basis of the Berliner transmitter patent, which is now the subject of a suit for annulment of the patent thereon, brought against the Bell Company by Ex-United States Attorney-General Miller.‡ The inspector is reported to have stated that "the company fully expects to lose this suit, but until it does, it holds it has the right to collect royalties."

Messrs. Kohn and Thomas Martindale, chairman of the committee of the Trades League, which was pushing the Bell Telephone Company, of Philadelphia, for a reduction of rates, subsequently framed a letter to the Philadelphia company, setting forth the facts as above stated. The matter, however, was referred to Boston headquarters. It is claimed that all royalties paid to the Boston Company would have to be refunded if the suit was lost, and it is intimated that resistance will be made to its payment.

ELECTRICITY PRACTICALLY APPLIED.

This was the title of an interesting paper read before the Buffalo Electrical Society by Mr. Astley C. Terry, on March 23, last.

Mr. Terry illustrated his subject by exhibiting and operating the different apparatus under consideration, and confined himself more particularly to electricity as used in our homes, which he said, tends directly to augment the pleasure and luxury of living. The different appliances of this nature were followed from the simple and now common push buttons down to the more recent incandescent light and the electric motor.

It was shown how, by the aid of a small battery and connecting wires, the push button was made to ring a bell at a distance, and how the annunciator is utilized to indicate whence the ring comes; how, when slightly altered in form, the push button is attached to the doors and windows of houses, so that the opening of a door or raising of a window proclaims by the bell on the annunciator an attempted entrance by a burglar.

The manner in which the electric mat and the electric carpet indicates the presence of an intruder was also shown.

Mr. Terry explained how the thermostat is employed to give warning of the presence of fire and to regulate the temperature of a room; the manner in which electricity is made to wind and regulate clocks, to light gas, and to open doors.

Mention was made of the telephone as probably the most indispensable of electrical devices used in the modern household, and its operation was explained.

He said, in conclusion, that the application of electricity which is becoming more and more popular is the incandescent light, and that many of the dwelling houses now being erected are provided with wires for this purpose, although the current for operating the lights is not as yet in the neighborhood. Many reasons were given why the electric light is preferable to gas light.

NOTES OF GENERAL INTEREST.

A franchise has been secured by an American syndicate for an electric railway from the Montreal City Council of St. Louis de Mile End.

The question of municipal electric light plants is now being agitated in the following-named cities: Boston, Cleveland, Baltimore, Omaha, and Kansas City.

On March 31 Kingsley's dam at Manchester, Mich., was carried away, thereby depriving the electric light plant of its power. The town will be in darkness until the dam is rebuilt.

The American Federation of Labor has issued a petition to Congress requesting that a law be passed for the establishing of a government telegraph and telephone system.

By the bursting of the fly wheel of the engine in the station of the Brush Electric Light Company, Niagara Falls, N. Y., on March 30, that place was without street ights for several nights.

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‡ See page 97 Electrical Age, February 18, 1893.

THE BALL SYSTEM OF ELECTRIC LIGHTING.

THE DYNAMO.

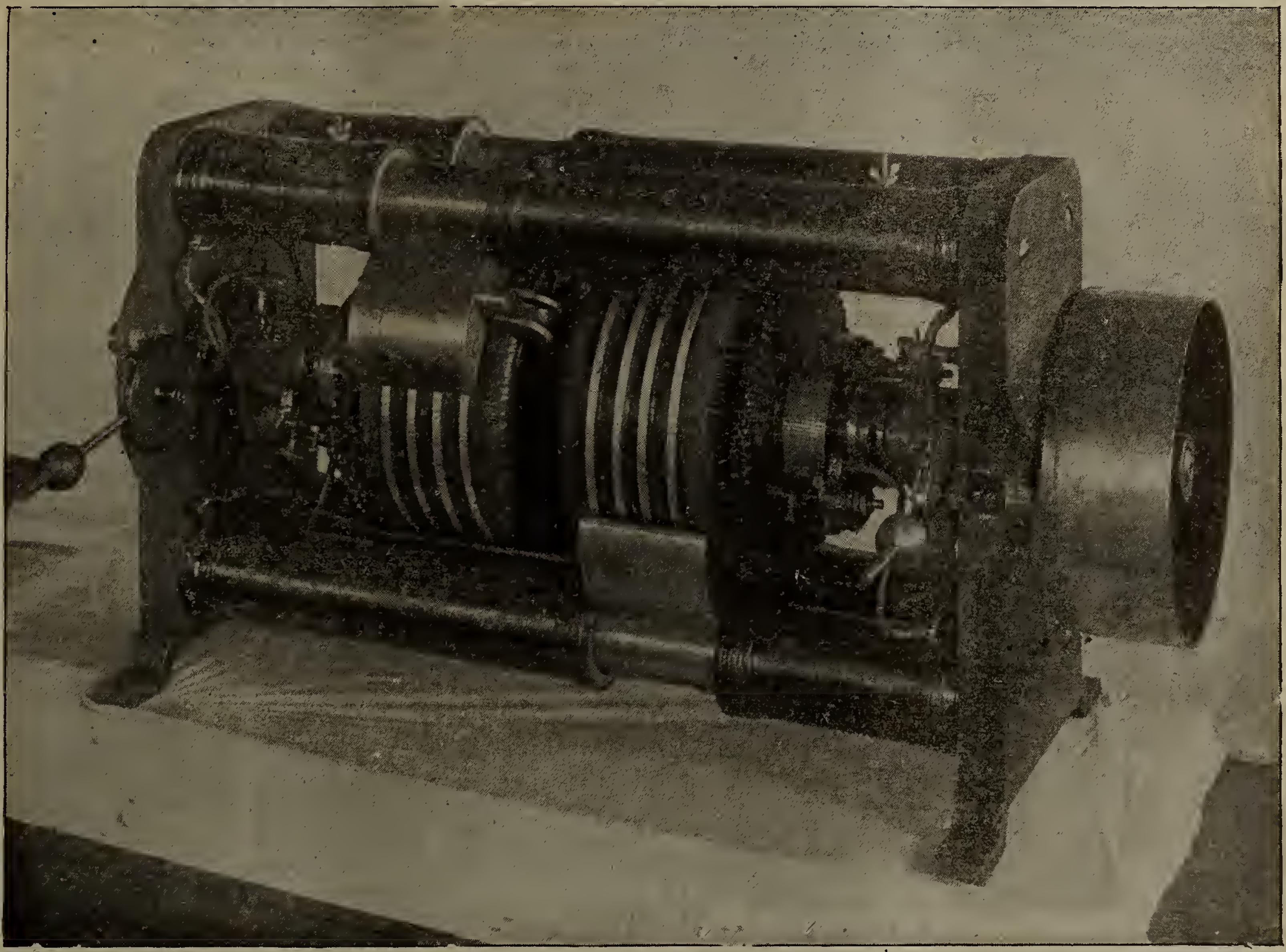
Among the most unique dynamo electric machines ever produced is that known as the Ball dynamo, and the controversies concerning its efficiency which were created after its first appearance, are still fresh in the minds of most electrical people.

It was at the Philadelphia electrical exhibition in 1884, that the Ball dynamo was first brought to public attention, and it was urged by many electricians of note that it was impossible that a machine constructed on the lines of the Ball dynamo could be otherwise than inefficient. But it did not take long to prove by practical tests that these claims were not well-founded; on the contrary the fact was well established that, notwithstanding these hasty criticisms, the machine was in reality a highly efficient one, and the test of time has fully confirmed all of the claims made for it.

In the past ten years arc light dynamos have been born and died, but the Ball still lives and is the basis of a large and prosperous electrical industry. Certain it is, if the machine had any radical and inherent defects it would have been consigned to its grave long ago, but when it is remembered that to-day it stands as a very successful competitor of many other equally well-known machines only one conclusion can be deduced and that is that the dynamo must possess sufficient merit or it would not be in the market to-day.

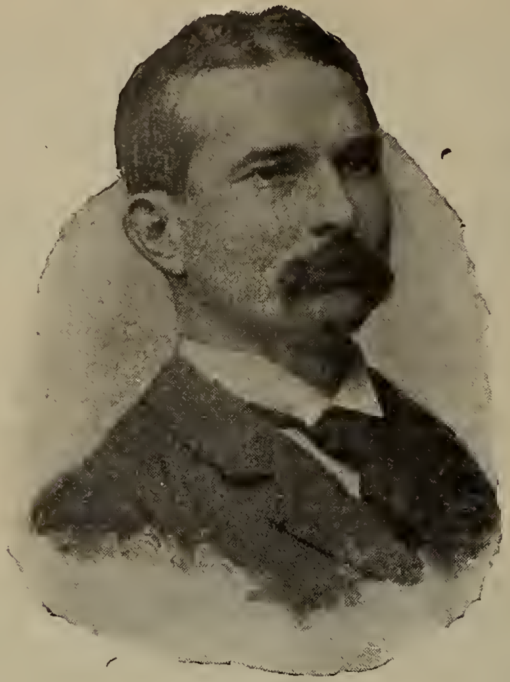
What are its merits? They are the merits that every business man looks to first thing when he is considering the investment of his capital, viz.: the best returns for the outlay.

The most striking feature of the Ball dynamo is the arrangement of the pole-pieces. In all other dynamos the armature is encircled by two pole pieces but in the Ball machine there are two armatures, each with but *one* pole piece. It was from the peculiarity in its construction that it was generally known in its earlier days as the uni-polar machine, and it was this particular feature that formed the basis for the criticisms that were made concerning the commercial efficiency of the machine. By reference to the accompanying illustration of the dynamo this unique method of construction will be observed. There are two pole pieces as in other bipolar machines, but they are not placed opposite to each other as is the case with other dynamos. They are set diagonally, and each pole piece generates a field for one armature, thus requiring two armatures. This method of construction has proved to possess great merit, and the main claims made for the machine are that less material is required in its construction; it has less internal resistance; generates less heat; has greater efficiency, and to give equal results requires less power than any other dynamo in the world.



BALL ARC LIGHT DYNAMO, CAPACITY ONE HUNDRED AND TWENTY 2,000 C.P. ARC LAMPS.

Another important feature of the Ball dynamo is that two separate circuits may be supplied simultaneously, one from each armature, or the armatures may be combined to supply one circuit. Thus it is possible to operate arc or incandescent lights separately or both in combination on one circuit, or in two separate circuits at the same time. This machine is therefore practically equivalent to two of the usual make, and should one of the armatures become disabled the other armature will maintain nearly three-fourths of the full rated capacity of the machine. Overspeeding does not affect it, nor does overheating result when it is subjected to the variable speed of engines used in mills, factories, etc.



ROYAL E. BALL.

evidence of the substantial character of its construction it is worthy of note that machines of this make have been running successfully for ten years; indeed the very first Ball dynamos made are still in practical operation. The durability of the Ball machine is due, principally, to the double armature feature, on account of the small amount of wire necessary to generate the required electromotive force, and therefore less heating from the resistance of the said wire. The speed of the machine can, if necessary, be increased to furnish current for 50 per cent. more lamps than its nominal capacity, without danger of destroying the insulation of the wires. This gives a large margin of safety.

CHARLES E. BALL.

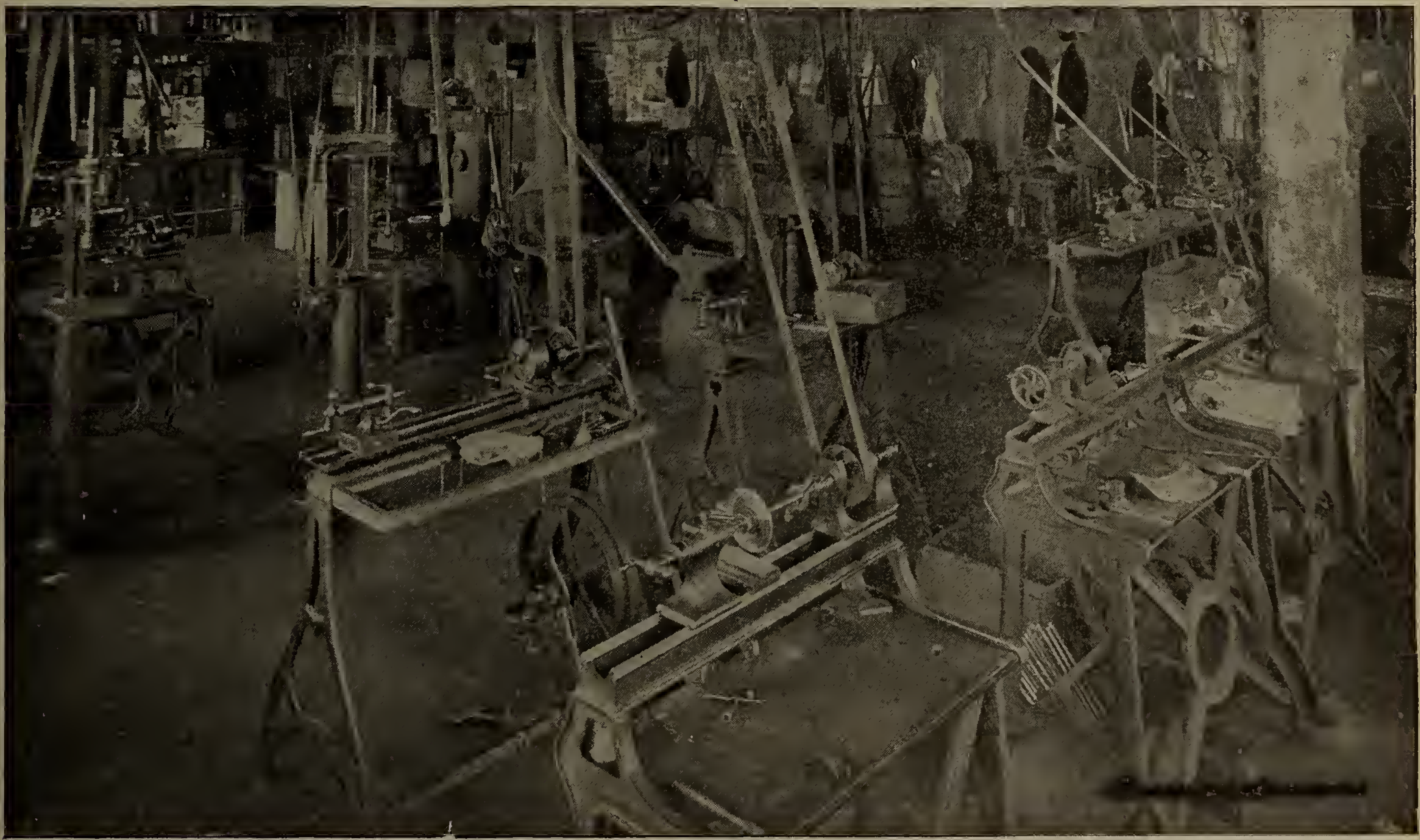
LAMP TESTING DEPARTMENT.

In its mechanical and electrical details the closest attention has been given to the machine, and as an

The Ball company has added to its dynamos an automatic regulator of novel construction. A small magnetic bridge is placed over the exposed parts of one of the armatures as an external magnetic circuit between the two magnetic poles of the armature. By a combination of levers this bridge is connected to a step-by-step motion which operates the brush-holding yoke, and moves forward or backward, according as the field of force of the armature varies from the rising or falling main current flowing through it. This regulator, it will thus be understood, is positive in its operation yet simple in construction.

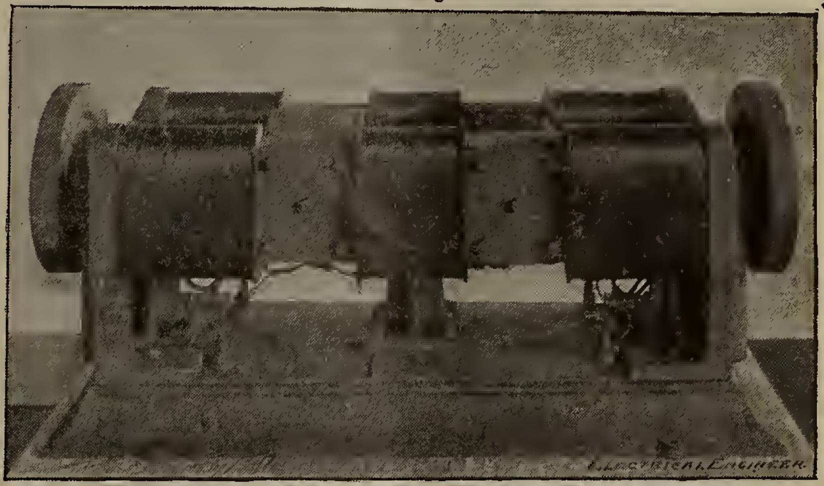
W. A. NICHOLSON.

Another feature recently added to the Ball dynamo is for the purpose of rendering it self-contained and automatic. It is simply a slight modification of the regular machine, but involves no complicated mechanism.


ARC LAMP DEPARTMENT, BALL ELECTRIC LIGHT CO.

THE ARC LAMP.

The Ball Electric Light Company does not confine its operations to the manufacture of dynamos alone; it makes arc lamps as part of its electric light system, and these lamps are said to be as practical and serviceable as the Ball dynamo. For the manufacture of arc lamps the company maintains a very complete department, which occupies part of one of the floors of the factory, No. 404 West 27th street, New York City. The room, which is 70x70, is well lighted, having large windows on two sides. The capacity of the lamp department is 40 complete arc lamps per day. The lamps are neat in appearance and substantially constructed. There are no springs, friction clutches, or dashpots to get out of order, every movement being positive and mechanical. Their operation is unaffected by vibrations caused by storms, jarring from working machinery, or other causes that are liable to interfere with the steadiness of the light from an arc lamp.

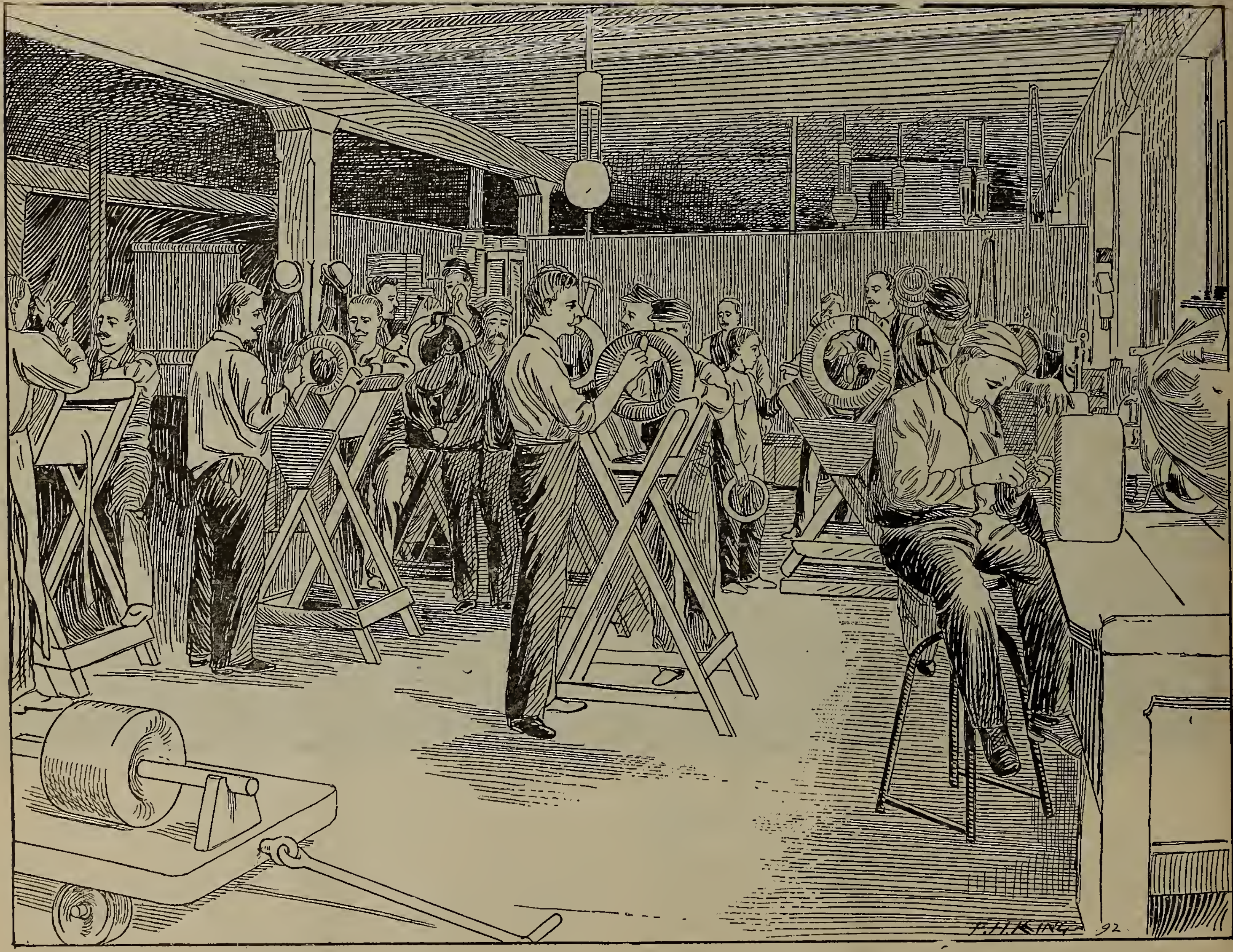


THE FIRST BALL DYNAMO.

An important feature of these lamps is, that they can be adjusted to burn on any system or circuit, either arc or incandescent, and as far as the light is concerned it is white, powerful, steady and noiseless. The foregoing description refers particularly to the Ball single arc lamp; the Ball Company has, however, another style of arc lamp, which is designed to burn all night. It is known as the "Ball Reciprocating Carbon All-Night Lamp," and while it has but one carbon, it possesses all the advantages of the double, triple and disk carbon lamps. It is, moreover, free from all the disadvantages of many lamps of these classes such as complicated mechanism, unreliability and frequent repairs.

DYNAMO ASSEMBLING DEPARTMENT.

These all-night lamps are provided with a flat top or positive carbon which swings across the point of the round carbon underneath, and as the upper carbon wastes away at any one point along the edge, a fresh point is presented to the arc periodically. In this way one portion of the flat carbon after another is consumed. The reciprocating or oscillating movement of the carbon is accomplished by a device (see illustration of the all-night lamp) which moves in a downward direction, at the same time feeding the upper carbon and giving to it a to-and-fro movement over the bottom stationary round carbon. By this arrangement the point or crater of the upper carbon is kept in line with the point of the negative or bottom carbon, thereby producing a quiet non-shifting or travelling arc. In practical operation shadows, hissing and flickering are absent in this lamp. These lamps give a light of 800 c. p. with a current of four amperes, and the Ball Company claims that lamps of this power are superior for street lighting in towns or villages, where shade trees interfere with the light. The company claims that in such situations, economical



ARMATURE WINDING DEPARTMENT.

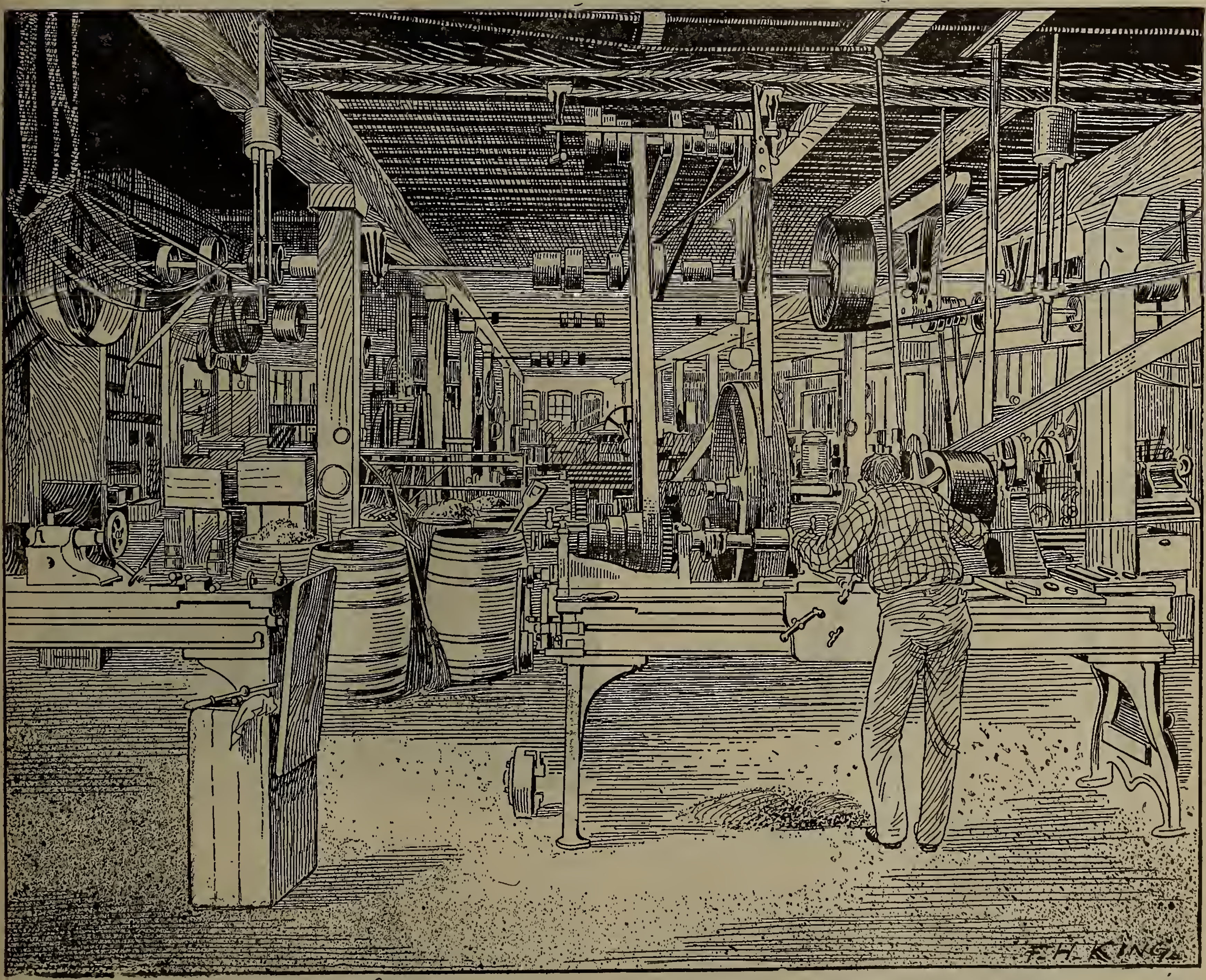
lighting by lamps of large candle power is impossible, Three 800 c.p. Ball lamps are operated on one horsepower, each taking one-third of one horsepower. By installing a slightly larger number of such lamps a better distribution of light is obtained, and the shadows cast when more powerful lights are used are overcome.

The cost of lighting by this system is said to be less than that of the incandescent system.

In addition to the lamp manufacturing department, there is another, adjoining, devoted to the purposes of testing the lamps, which has a capacity for testing 200 lamps at one time. A view of this department is given herewith, showing the method of testing the lamps.

LONG DISTANCE SERIES—INCANDESCENT SYSTEM.

In order to widen the application of the Ball system of lighting the company adopted a well-known series—incandescent lamp with combination socket and cut-out, and it is ready to install complete long distance series systems of lighting. The lamps are run in series on a single circuit of variable electromotive force, but on a small, constant current of 4 to 6 amperes. They are of low resistance, durable and efficient, remaining bright throughout their entire service. The advantages claimed for this system are: 1, low first cost; 2, economy in maintenance; 3, ease of regulation; 4, long life and brilliancy of lamps; 5, reliability, simplicity and efficiency; and 6, flexibility of distribution. The long-distance incandescent dynamo, like the arc machine, has two armatures, is self-regulating and will carry from one lamp up to its rated capacity without attention.



BALL ELECTRIC LIGHT CO. MAIN MACHINE SHOP.

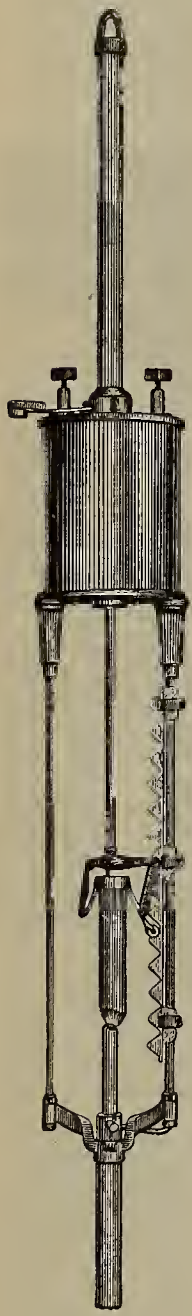
THE BALL FACTORY.

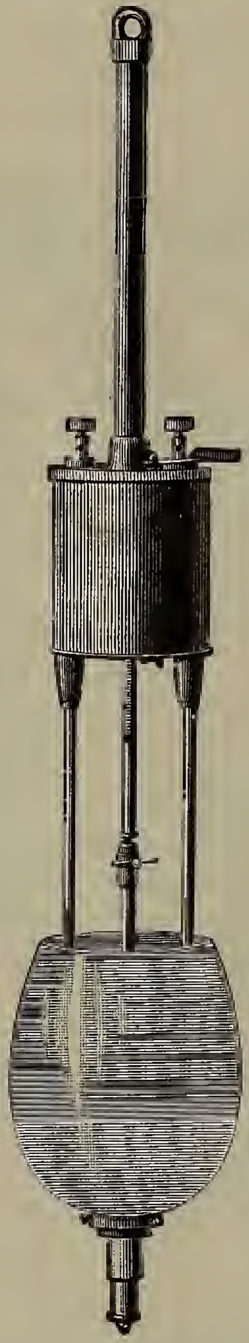
The factory of the Ball Electric Light Company is situated at the corner of Ninth avenue and 27th street, New York City. It is four stories in height with a frontage on 27th street of 200 feet, and 100 feet on Ninth avenue. The building is completely and perfectly equipped for the purposes for which it is used; the steam generating plant consists of a battery of boilers, and the power plant of Corliss engines with an aggregate capacity of over 150 H. P. Every modern convenience is provided, and everything is arranged with the view of producing the best quality of work with minimum delay. The offices of the company are located on the third floor, and are divided from the main portion of the space by a partition running along the length of the building. On this floor is also located the main machine shop, a view of which is given. Here are found lathes, planers, turners, and boring machines, and all the necessary machinery for dynamo construction.

The dynamo assembling department is also located on this floor, a view of several frames and parts of dynamos all ready to be assembled, being given herewith.

OFFICIALS OF THE BALL COMPANY.

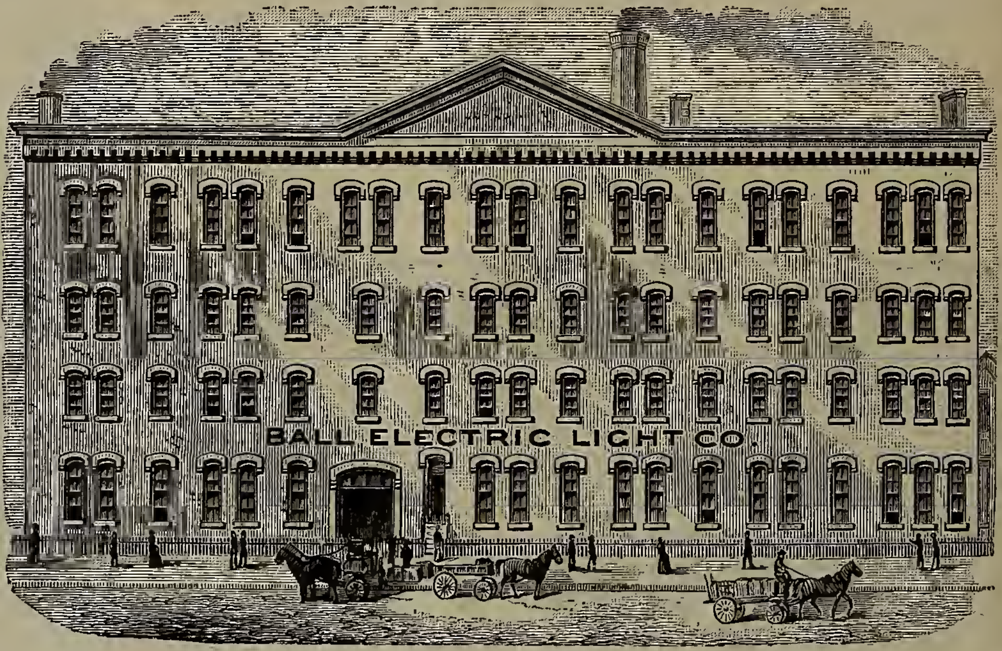
The real power of an establishment of this magnitude resides, of course, not in the steam boiler or engine, or in the building; these are merely secondary to the prime power which is found in the persons who are at the head of the enterprise. There is where the power lays, really—in the minds of the managers. All plans originate there and the means of carrying them into execution are really subsidiary thereto. Therefore, to complete a description of an industry of this kind, reference to the master minds who run it must not be omitted. The officers of the company are: W. L. Brown, president; Charles E. Ball, vice-president and general manager; Royal E. Ball, electrician; J. S. Bell, secretary; George R. Cullingworth, treasurer; W. A. Nicholson, superintendent. We have not been able to secure the pictures of all of these gentlemen, but those we have been fortunate enough in getting we place before our readers in this article.

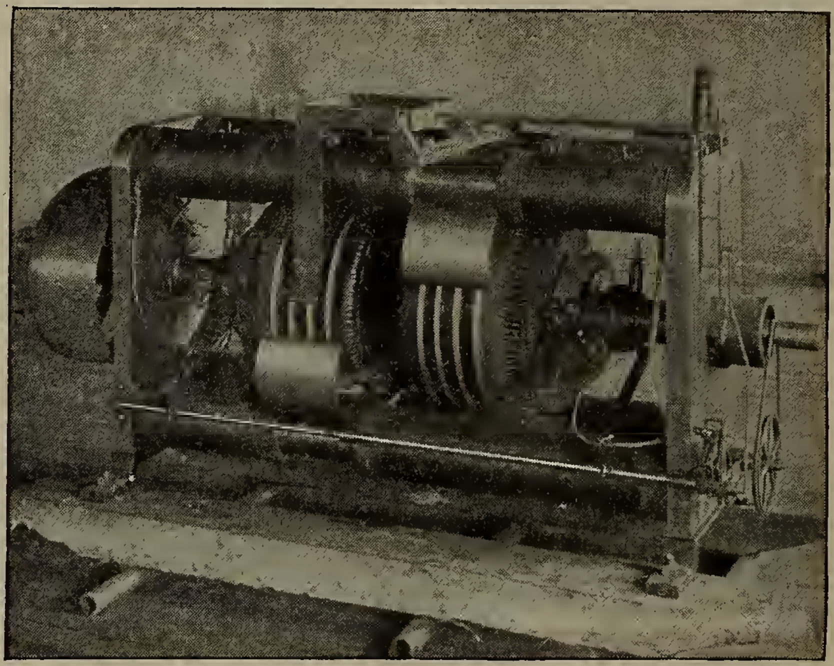

BALL ALL-NIGHT LAMP.


BALL SINGLE LAMP.

Mr. Charles E. Ball is the inventor of the system. He was a mining engineer prior to 1880, when he turned his attention to electrical engineering. Being of an inventive turn of mind, which, coupled with his mining experience, he in 1880 produced his first electrical invention—an electrical plunger and rock drill. From this his attention was turned to the dynamo-electric machine, with the result of the production of that remarkable dynamo which is the main subject of this article. The results of Mr. Ball's investigation and work are characteristic of the man's ingenuity. He started out on a line different to that on which all other electrical engineers were plodding, and he made a record of his own, unique and distinct from all others.

Mr. Royal E. Ball, the Company's electrican, is a brother of Mr. Charles E. Ball. His training fitted him for the electrical profession, being a graduate of the Rensellaer Polytechnic Institute of Troy, N. Y., and a civil engineer by profession. Both of these brothers, by persistence and unity of purpose, have brought the Ball Electric Light Company's system up to a level that is not overreached by any other system, and so long as the electrical work remains in their hands the company will always have something substantial as a basis for its business.


BALL ELECTRIC LIGHT CO.
FACTORY OF THE BALL ELECTRIC LIGHT CO., NEW YORK CITY.


BALL DYNAMO, SHOWING AUTOMATIC REGULATOR.

Mr. W. A. Nicholson, the superintendent of the company, is a gentleman well-known in the trade, and whose business capacity is of the right kind to bring success to his company. He pays close attention to business, and to his experience and counsel a good share of the company's success is due.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

NEW CORPORATIONS.

Augusta, Me.—The Atlantic Shore Line Electric Railroad Company has petitioned for incorporation.

Cleveland, O.—The Cleveland Electric Railway Co. has been organized with a capital of $6,500,000.

Dayton, O.—The Dayton Traction Company has filed articles of incorporation. Capital, $200,000. Incorporators: Dennis Dwyer, O. B. Brown, W. A. Mays, William Hoffman, Walter W. Smith, Fred Reibold, S. J. Patterson and Oscar M. Gotschall.

Dover, Del.—The St. Georges' and Kirkwood Electric Railway Company has been incorporated.

Fall River, Mass.—The Fall River and New Bedford Street Railway Company has been incorporated with a capital of $300,000. It will build roads in both places and in the towns of Westport and Dartmouth. Rufus A. Soule is at the head of the enterprise.

Haverhill, Mass.—The Haverhill, Georgetown and Danvers Railway Company has petitioned for incorporation.

Norwalk, Ohio—The Norwalk, Fairfield and Southern Railroad Company has petitioned for incorporation.

Albany, N. Y.—The Northport Electric Light Company, of Northport, Suffolk Co., N. Y., was incorporated April 4 with a capital of $25,000. Directors: J. W. Fowler; J. W. Olmstead; O. Darling and others.

Chicago, Ill.—American Reflector and Lighting Company. Capital, $100,000. Incorporators: Perry Landis, William A. Toles and Robert Latham.

Depere, Wis.—The Depere Electric Light and Power Company has filed articles of incorporation. Capital, $20,000.

Meriden, Conn.—The American Automatic Lighting Company. Capital, $50,000. Incorporators: F. A. Cody, A. E. Cody, L. T. Lawton and F. L. Lawton.

Parkersburg, W. Va.—The Parkersburg Gas and Electric Co. has been incorporated with a capital of $23,350. Incorporators: J. V. Rathbone, C. H. Shattuck, C. H. Turner, C. S. Despard, and J. M. Jackson, jr., all of Parkersburg.

San Antonio, Texas—The Citizens' Electric Power and Street Railway Company of San Antonio, has been incorporated with a capital of $300,000. Incorporators: A. H. Dillard, C. E. Harris, F. C. Dow.

St. Paul, Minn.—The Spring Valley Electric Light and Investment Company has filed articles of incorporation.

Trenton, N. J.—Articles of incorporation have been filed by the Essex-Hudson Light and Heat Company. Capital, $2,000,000. Incorporators: George R. Gray, Emerson McMillan, of Columbus, Ohio, and Henry B. Wilson of New York.

POSSIBLE CONTRACTS.

Allentown, Pa.—It is expected that Allentown and Easton will soon be connected by an electric railway.

Brazil, Ind.—It is stated that a company has been organized here to construct a street railway between this place and Terre Haute.

Bridgeport, Conn.—The purchasers of the Bridgeport Railroad propose to construct and operate a horse car line at Pleasure Beach.

Buffalo, N. Y.—The street railway company is preparing plans for the erection of a large new powerhouse on the East side, to furnish about 4,500 H. P.

Cazenovia, N. Y.—This town has applied for authority from Albany to build an electric light plant.

Camden, N. J.—A plot of ground has been set aside at Collingswood for a park, and it is probable that the Camden Horse Railroad Company will construct an electric line to that point.

The Camden Street Railroad Company will double its electric line to Merchantville.

Chicago, Ill.—The West side Cable Railway Company expects to make extensions to its system.

Cleburne, Tex.—The residents of this town want a street railway.

Detroit, Mich.—St. Clair Flats desires to be electrically lighted. Mr. J. N. Neil is at the head of the movement.

Dayton, O.—The street railway company intends to extend its Green line to Browntown and Miami City.

Elkhart, Ind.—It is reported that an electric railway between this city and Goshen is assured.

Elmore, O.—The village council has granted a franchise to the Lake Erie and Northwestern Ohio Electric Street Railroad and Light Company.

Great Bend, N. Y.—An electric light plant here is being talked of.

Haverhill, Mass.—It is reported that E. P. Shaw will construct, this Spring, that section of street railway necessary to connect the Haverhill and Groveland Street Railways at West Newbury with the electric road at Newburyport.

Lawrence, Mass.—The Lowell, Lawrence and Haverhill Street Railway Company has asked for the right to double track Water street.

Mechanicsburg, Pa.—There is talk of constructing a trolley line between this city and Harrisburg.

Montclair, N. J.—Proposals for a street railway in this place are invited by the township committee. Henry L. Yost is the town clerk.

Montclair, N. J.—The township committee is ready to consider proposals for an electric light plant. Henry L. Yost is the township clerk.

Oakland, Cal.—The East Oakland Railway Company has petitioned for a franchise.

Pawtuxet, R. I.—The Pawtuxet Valley Electric Railway Company has asked permission to lay tracks on certain streets of this town

Pekin, Ill.—W. L. Prettyman has been granted a franchise for the Pekin Rapid Transit Company to construct an electric railroad in this city.

Provincetown, Mass.—It is reported that an electric railroad will be built during the summer to connect Buzzard's Bay with Long Neck, Point Independence, Onset Bay, Agawam, Wareham and other places.

Port Henry, N. Y.—It is expected that an electric light plant will be installed by the town in the near future.

Springfield, N. Y.—The residents of this town are anxious to have the streets lighted by electricity.

Sturgis, Mich.—This town is negotiating for a municipal electric light plant.

FINANCIAL NOTES.

The Edison Electric Illuminating Company, of Boston, at a special meeting on March 31, voted to issue $3,050,000 of stock to take up the convertible bonds.

The New Bedford Gas & Edison Light Company, New Bedford, Mass., has declared a quarterly dividend of 1½ per cent., payable April 15.

PERSONAL.

Mr. C. McL. Paine, formerly connected with the *Western Electrician* of Chicago, and *Electricity* of New York, is now connected with the *Architect's Electrical Bulletin*, of this city, in the capacity of business manager.

NEW YORK NOTES.

Office of The Electrical Age,
First Floor, World Building,
New York, April 8, 1893.

Mr. E. J. Hamilton, father of B. F. Hamilton, the popular manager of the Sawyer-Man Electric Co., of this city, died on April 2 last after a short illness. Mr. Hamilton was manager of the real estate department of the Equitable Life Assurance Society, and was for 45 years a member of the Olive Branch Lodge of Odd Fellows, Harlem, N. Y. He was a man well liked by all who knew him, and the many friends of Mr. B. F. Hamilton in the electrical trade sympathize with that gentleman in his loss.

On April 5 a fire destroyed 1,000 barrels of flour on the pier at the foot of Coenties slip. It is stated that an electric light wire "did it."

The American Telephone Booth Co., 18 Cortlandt street, city, is distributing blotters on one side of which facts regarding sound proof telephone booths are set forth.

Hon. Wm. E. Simonds, Ex-Commissioner of Patents, and senior member of the law firm of Simonds, Burdett & Frothingham, Potter Building, city, is the author of a condensed treatise on the law of patents for useful inventions.

The Edison Electric Illuminating Company, of this city, has closed a contract with the city to place an additional electric lamp in centre of every block along Fifth avenue, from Waverly Place to 59th street.

The Gas Commission of this city, at a meeting on April 5, adopted a resolution rescinding the contract with the Thomson-Houston Electric Company for lighting Fourth avenue, south of 42d street, Irving Place, Bryant Park, and Church street, from Canal to Chambers streets unless the company shall proceed within ten days to light this district. The company claims that it has been prevented from going ahead through subway complications.

The Dahl Electric Co., 120 Liberty street, city, sold, during the last week in March more than 650 Meston alternating fan-motors. Fifty Storey motors were also sold by it during the same period. The company has orders for the new alternating motors of from one to five horse-power, far ahead of its capacity. A new sewing machine electric motor with brake appliance is an attraction in the window of the Dahl Electric Co.'s offices.

Rossiter, MacGovern & Co., is the name of a new firm just opened for business at 39 Cortlandt street. They handle machinery and electrical supplies, engines, boilers and dynamos, and are sole agents for Ferrumvita welding compound. The members of the firm are Van Wyck Rossiter, Frank MacGovern and Isaac M. Sutton.

H. C. Adams, President of the Phillips Insulated Wire Co., 39 Cortlandt street, has closed a contract with the town of Gravesend, Kings Co., N. Y., for a 400 arc light plant on the Fort Wayne Electric Company's system. Five Wood dynamos of 80 lights each will be installed, and it is needless to say that "O. K." weatherproof wire will be used throughout this system. About 40 miles of this brand of wire will be required. Mr. Adams has taken an order for 57½ miles of "O. K." weather proof wire for the Neptune Electric Co., Asbury Park, N. J.

H. C. Adams, Jr., 44 Broad street, agent for the Fort Wayne Electric Co., has just contracted with the Neptune Electric Co., Asbury Park, N. J., to supply a 3,000 light alternator of the new "Wood" type.

The Zucker & Leavitt Co., 8 to 14 Grand street, city, manufacturers of the well-known Hercules motors and dynamos and the improved American Giant dynamo, is doing a very satisfactory trade in dynamos and motors. The Hercules dynamos and motors seem to be gaining in favor, as large sales of these machines are reported. The Giant plating dynamo has become the standard plater and, as a consequence, has a steady sale. This company has already forwarded a large exhibit of its apparatus for the World's Fair exhibition at Chicago. Mr. Max Mayer, the electrician of this company, will personally superintend the installation of this exhibit. This will include a complete line of motors and dynamos and plating plants in practical operation. Visitors and others will thus be able to judge for themselves the actual value of these machines and study their application. The exhibit will be lighted by 200 incandescent lamps and six "Ward" arc lamps with current from the Hercules dynamos. The various electro-plating baths will be supplied with current from one No. 5 electro-plating dynamo.

Mr. J. A. Hanna, of the McGuire Mfg. Co., Chicago, manufacturers of McGuire trucks for electric cars, was in town last Thursday and closed some orders for trucks. Mr. Hanna dropped in to see us while in the city.

F. P. Hover, of the New Castle Car Mfg. Co., New Castle, Pa., was a welcome caller at this office last Thursday. He closed orders for cars while in the city.

W. S. Chesley & Co., 24 Morris street, Jersey City, N. J., make a specialty of repairing street railway apparatus, large dynamos, motors, etc. They have available for testing purposes 60 H. P. They also erect complete electric plants, and buy and sell electric light and power apparatus. At the present time they have on hand the following named machines: One No. 8 Edison dynamo of 360 lights; 1 T. H. 50 light dynamo; 1 200 light Elektron; 1 200 light Eickemeyer; 1 600 light Easton; 1 250 light Continental; 1 240 light Weston; 1 3 arc light American; 2 Excelsiors of 10 arc lights each; 1 Knowles; 1 10 arc light American; 1 Sprague 7½ H. P. motor; 1 Sprague 15 H. P. motor; 1 Barriett 220 volt motor of 1 H. P. and 1 of the same of ½ H. P. and 1 Erie engine of 18 H. P.

The Mount Morris Electric Light Company on April 6, brought suit against the United States Horse and Cattle Show Society, to recover $1,950 for light furnished during the exhibition of the society last May. The defendants set up a counter claim for $2,000 on the ground that the light was so poor that it was at times difficult to tell horses from cows or any other quadrupeds. The jury awarded the plaintiff $2,102.55.

The Chicago Electric Cable occupies a foremost place among the many makes of cables, and its position is based upon its merits. They are made in every size and style for every electrical purpose—telegraph, telephone, electric light and electric railway. These goods include seamless rubber covered wire and cables, plain, braided and armored; they are impervious to the weather, heat, cold or moisture and are flexible. They are recommended by the highest electrical and commercial authorities. The sole agents for these cables are The India-Rubber Comb Co., and the Goodyear Hard Rubber Co., 9–13 Mercer street, City. W. T. H.

AUTOMATIC ELECTRIC OR GAS LIGHTER.

An automatic door spring electric lighter for gas and electricity has recently been put upon the market by the New York Electrical and Development Company, which is an ingenious device. It is similar to an ordinary door or window spring, and when the door is opened the automatic spring electric lighter turns on the electric light or gas light, as the case may be. The light is extinguished by *opening* the door the second time, and not by *closing* the door on entering, as might be supposed. On entering a vault, a refrigerator, a closet, or a room of any sort, the act of opening the door thereto turns on the light, the light continuing burning after the door has been closed and while the person is still within. Then on opening the door again to leave the room the light is extinguished, thus, it will be understood, that the light is cut in or out by the act of *opening* the door. This ingenious and valuable device is sold by Stanley & Patterson, 32 Frankfort street, New York city.

TRADE NOTE.

The Tuerk Water Motor Company, Fulton, N. Y., has just issued a neat catalogue of its well-known water motors and ventilating fans. The latter are designed to be operated either by water or electric power.

THE P. CLAUS DYNAMO COMPANY.

On April 5, the P. Claus Dynamo Company was incorporated under the laws of New York State with a capital of $100,000. The new company will conduct the business heretofore carried on by P. Claus & Co., at 550–552 West 36th street, New York City, viz.: the manufacture of the P. Claus slow speed incandescent dynamo. The new business will be under the management of Mr. P. Claus, who has been elected to the position of president; Mr. H. Claus is vice-president and A. Bower, treasurer.

Mr. P. Claus, the president, was born in Berlin, Germany, where he acquired his electrical experience in the great works of Siemens & Halske. He was also at other times connected with different electrical concerns in Germany, and through his experience in America he has succeeded in building a monument to his ability and management, which is represented by the new concern.

QUEEN & CO., INCORPORATED.

Queen & Co., Incorporated, Philadelphia, are making a special drive of their "Magnetic Vane" ammeters and voltmeters, which instruments are favorably known throughout the country. They are adapted for constant switchboard use, and will render service twenty-four hours per day without disadvantage. This is an important feature and will be appreciated by those familiar with the subject. A number of the larger manufacturing concerns use these meters for installation work, as they present great advantages in being constant, accurate, durable, handsome in appearance and low in price. More than twice as many were sold in 1892 than during the previous year. Circular No. 420, which contains full information, will be mailed by the makers upon application.

The Electrical Age's Illustrated Record of Patents.

Issued April 4, 1893.

494,146. Magnetic Lock. Alcuin E. Kinter, Painesville, Ohio. Filed Apr. 4, 1892.

494,149. Process of Manufacturing Filaments for Incandescent Lamps. Alexander de Lodyguine, Paris, France, assignor by mesne assignments, to the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. Filed Sept. 14, 1888.

494,150. Incandescent Lamps. Alexander de Lodyguine, Paris, France, assignor, by mesne assignments, to the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. Filed Sept. 14, 1888.

494,151. Filament for Incandescent Lamps. Alexander de Lodyguine, Paris, France, assignor, by mesne assignments, to the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. Filed Sept. 14, 1888.

494,828. Electrical Measuring Instrument. Edward Weston, Newark, N. J. Filed Jan. 14, 1892.

494,829. Recording Voltmeter. Edward Weston, Newark, N. J. Filed March 18, 1892.

494,830. Ground Detector for Electric Circuits. Edward Weston, Newark, N. J. Filed Sept. 10, 1892.

494,832. Electric Clock. Herman Wubbeler, Beaver Falls, Pa. Filed May 21, 1892.

494,836. Dynamo-Electric Machine. Arthur S. Baxendale, Selangor, England. Filed April 22, 1892. Patented in England Dec. 9, 1890.

494,849. Separator for Battery Elements. Chaimsonovitz P. Elieson, New York, N. Y., assignor of one-half to Francis A. Pellas, Oggebbio, Italy. Filed July 9, 1892.

494,852. Galvanic Battery. Derrick H. Fitch, Cazenovia, N. Y. Filed Nov. 22, 1892.

494,856. Electric Generator or Motor. Walter T. Goolden and Llewelyn B. Atkinson, London, England. Filed Jan. 3, 1893. Patented in England June 17, 1892.

494,871. Trolley-Pole Catcher. Edward L. Langheinz, Brooklyn, N. Y. Filed Nov. 10, 1892.

494,923. Jail-Door Alarm. William S. Hull, Sheffield, Ala. Filed Sept. 19, 1892.

494,924. Jail Lattice or Opening. William S. Hull, Sheffield, Ala. Filed Nov. 16, 1892.

494,961. Electrical Measuring Instrument. Adolph Koepoel, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Nov. 17, 1892.

494,966. Circuit-Closing Clock. Herbert S. Page, Medford, assignor to Edmund D. Spear, Boston, Mass. Filed Oct. 3, 1892.

494,995. Cut-Out for Brush Lamps. Benjamin Adair and Charles H. Klewer, Denver, Colo. Filed Nov. 18, 1892.

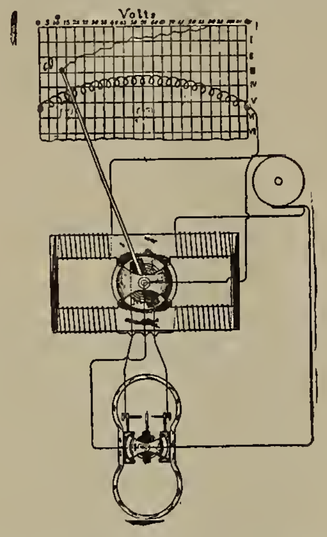
PATENTS—Continued.

494,562. Telautograph. Elisha Gray, Highland Park, Ill. Filed July 16, 1887.

494,565. Controlling Switch for Electric Motors. Warren S. Hill, Boston, Mass., assignor to the W. S. Hill Electric Company, of Maine. Filed March 31, 1892.

494,585. Means For Electrically Heating Crucibles. Willis Mitchell, Malden, assignor to the American Electric Heating Company, Boston, Mass. Filed June 13, 1892.

494,586. Apparatus For Electrically Heating Crucibles. Willis Mitchell, Malden, assignor to the American Electric Heating Company, Boston, Mass. Filed July 28, 1892.



494,829—RECORDING VOLT METER.

494,587. Electric Coal-Mining Machinery. Edmund C. Morgan, Chicago, Ill. Filed July 6, 1891.

494,596. Police-Patrol System. John H. Ring, Lowell, Mass., assignor of three-eighths to James H. Pindar, Freeman W. Puffer, and Dennis J. Ring, same place. Filed June 21, 1892.

494,610. Electric Switch. George W. Webb, Wilkes-Barre, Pa., assignor of one-half to Walter Gaston, same place. Filed April 20. 1892.

494,629. Commutator-Brush for Dynamos. David W. Dunn, Pittsburg, Pa. Filed Aug. 13, 1892

494,657. Electric Meter. Milton E. Thompson, Boston, Mass. Filed May 19, 1891.

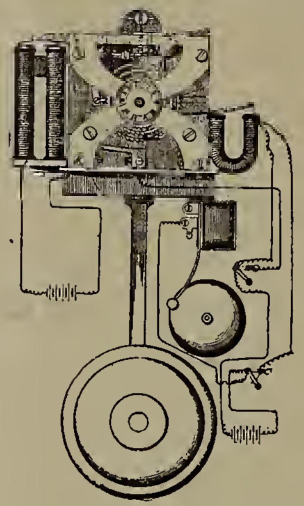
494,705. Electric-Locomotive Regulation. Rudolph M. Hunter, Philadelphia., Pa., assignor to the Thomson-Houston Electric Company of Connecticut. Filed July 12, 1892.

494,710. Telegraph-Pole. James W. Carver and Chester E. Carver, Pawlet, Vt., assignors to George H. Carver, Middle Granville, and Harvey E. Barden, Granville, N. Y. Filed Mar. 2, 1892.

494,721. Electric-Railway Trolley. Edward Martin, Detroit, Mich. Filed Sept. 19, 1892.

494,750. Switch for Electrical Currents. Henry P. Ball, Schenectady, N. Y. Filed July 1, 1892.

494,751. Car-Brake. Norman C. Bassett, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Jan. 7, 1891.



494,832—ELECTRIC CLOCK.

494,762. Electrical Annunciator. John B. Rogers, Washington, D. C. Filed May 31, 1892.

494,781. Circuit-Controller for Electric Motors. Warren S. Hill, Hyde Park, assignor to the W. S. Hill Electric Company, Boston, Mass. Filed May 16, 1892.

494,786. Automatic Cut-out for Electric Signaling-Boxes. Jacob F. Mehren, Chicago, Ill., assignor to the Gamewell Fire-Alarm Telegraph Company, New York, N. Y. and Chicago, Ill. Filed Jan. 8, 1892.

494,787. Automatic Cut-out for Electric Signaling Mechanisms. Jacob F. Mehren, Chicago, Ill., assignor to the Gamewell Fire-Alarm Telegraph Company, New York, N. Y., and Chicago, Ill. Filed Jan. 8, 1892.

494,827. Voltaic Cell. Edward Weston, Newark, N. J. Filed Nov. 24, 1891.

VULCANIZED FIBRE COMPANY,
Established 1873.
Sole Manufacturers of HARD VULCANIZED FIBRE,
In Sheets, Tubes, Rods, Sticks and Special Shapes to order. Colors, Red, Black and Gray. Send for Catalogue and Prices.
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CLARK is the only Company in the United States that makes a specialty of manufacturing under own patents, Electric Arc Lighting Apparatus for every purpose, including the finest arc lamp in every respect, suitable for any class of interior lighting, with plain or ornamental fixtures, and can be used on incandescent circuits, on any voltage from 65 upwards, in series or single, or on arc circuits of standard current.

ELECTRICAL AGE

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NEW YORK, APRIL 22, 1893.

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INCANDESCENT LAMP WITHOUT VACUUM.

Although the successful incandescent lamp that does not infringe the Edison patents seems slow in coming to the front, there is sufficient ground for the belief that such a lamp is forthcoming. There are several in view that are said to be independent of the Edison lamp, and the public are anxiously awaiting positive proofs that some one or all of them are of commercial value. In this issue, on another page, is the concluding part of an article began in the Electrical Age of April 8, by Mr. F. M. F. Cazin, who asks and discusses at length the question: "Can a practical, all-solid, incandescent lamp without vacuum be made?" Mr. Cazin proves by facts and figures that such a lamp is possible, and further states that a patent has been applied for on a lamp of this character. The principles of such a lamp are fully set forth in the article, and theoretically, at least, it would seem that a successful incandescent lamp without a vacuum can be made. When this lamp does finally make its appearance it will be extremly interesting to watch it as to its commercial value and reliability.

RAPID TRANSIT FOR NEW YORK CITY.

The Rapid Transit Commissioners have at last decided upon a plan for rapid transit for New York City. It provides for the extension of the Manhattan elevated railway; laying four tracks on portions of the line, three on others, and the building of a loop along West street. The commission has been trying for three years to solve the difficult problem of providing New York City with rapid transit.

THE GENERAL ELECTRIC COMPANY.

The first annual report of the General Electric Company, which is published elsewhere in this issue, will prove very interesting reading to electrical people. Not many of these know the exact relations between the General Electric Company and those concerns on which it was erected. The report, however, makes this point clear, and shows that the Edison General Electric Company, the Thomson-Houston Electric Company and the Thomson-Houston International Company, which are the component parts of the General Electric Company, still retain their independent existence, the General Electric Company purchasing and distributing the chief part of the apparatus manufactured by the first two companies. The balance sheet shows the net earnings for the eight months covered by the report, over and above all expenses, to have been $3,356,593.10. The assets are $50,934,973.59, and liabilities $49,910,019.00, leaving a surplus of $1,024,954.59. Touching the lamp patents, the report refers to the failure, after the most strenuous efforts, to produce a lamp which will not infringe the Edison patents, and expresses the belief that no different result will be achieved in the future. The report states that the company's interests can be protected without a harsh or offensive exercise of its rights, and in such a way as to satisfy the public of its desire to act in an entirely fair and liberal spirit. Suits against infringers of patents covering essential features in electric railway, lighting and power apparatus are now in progress and will be pushed as vigorously as possible. The inventions which the company controls, the report states, are the substantial basis of the arts of electric lighting, electric railways, and electric motive power now in general use. This is the first official expression from the General Electric Company concerning its business and policy, and there now can be no misunderstanding of the company's position. The report covers the eight months ending January 31, 1893.

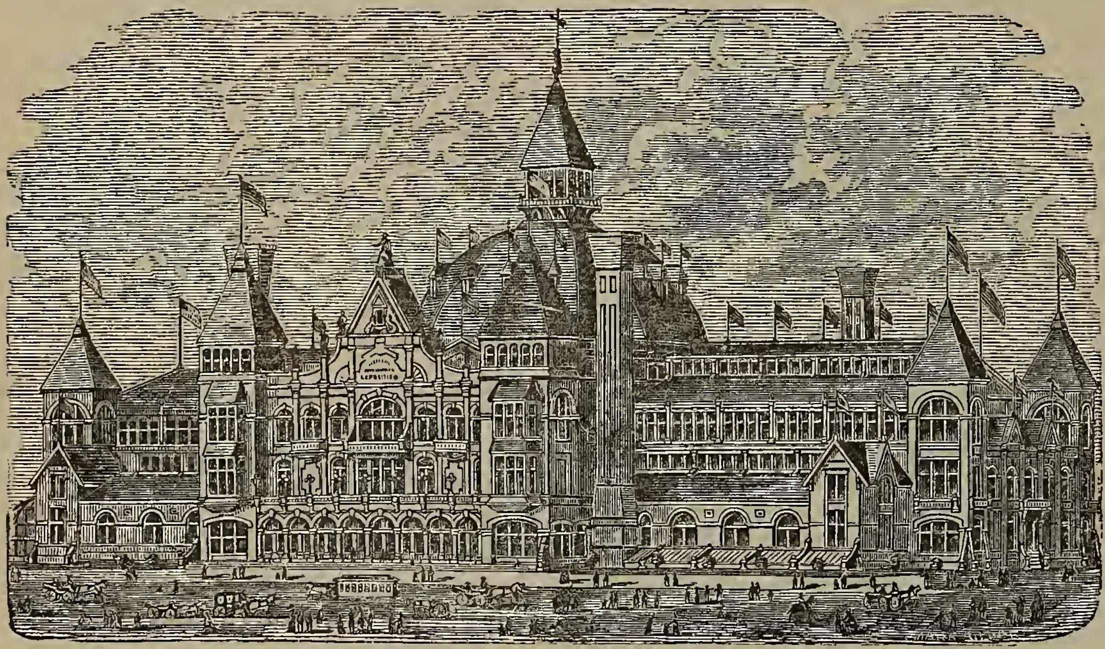
THE AMERICAN STREET RAILWAY ASSOCIATION.

We have received from Secretary W. J. Richardson of the American Street Railway Association a copy of a circular letter and circular of instructions regarding the American Street Railway Exposition which will be held in connection with the annual meeting of the Association in Milwaukee, next October. Copies of the letter and circular of instructions are given below:

Office of the Association, 166 Montague St.,
Brooklyn, N. Y., March 10, 1893.

Gentlemen—The Executive Committee of the American Street Railway Association is pleased to announce that the Milwaukee Industrial Exposition Building has been secured for the exhibition of supplies and manufactures of every nature used in the street railway business, in connection with the Twelfth Annual meeting of the Association, to be held in the city of Milwaukee, Wis., commencing the third Wednesday in October, 1893, and lasting three days.

The building has been engaged for two entire weeks, beginning October 9, and ending October 23; thereby giving ample time for the setting up and removal of the largest and heaviest exhibits.



EXPOSITION BUILDING, MILWAUKEE, WIS.

By the dimensions of the building above, as well as the lithographic sketch of the ground floor sent herewith, a comprehensive idea of the size of the building will be obtained.

The hall for the meeting is also in the same building on the second floor, and delegates will be enabled to examine the exhibits with much greater satisfaction than heretofore, on account of the nearness of the meeting hall to the exhibits.

An advantage, which will be appreciated by those desiring power, will be found in the 150 H. P. engine on the premises. The only additional charge therefor will be that which the cost of furnishing the same will amount to, *pro rata*, among the exhibitors using power.

The nearness of Milwaukee to Chicago is considered to be a great advantage this year for making a satisfactory and extensive exhibit, as everybody will, of course, attend the Chicago exposition; and it is believed not to be necessary to submit any argument setting forth the advantanges to material men of taking part in this exhibit to be made under so much more favorable circumstances than any other previously held.

The heaviest machinery and largest casting will all be under cover, and can, of course, be inspected much more advantageously than when in the street, especially should the weather be unpleasant any of the time. There is, of course, no extra charge for heating and lighting the building.

A blank application for space as well as the rules and regulations governing the exposition are sent herewith.

Should you desire to make application for space, will you please notify the Secretary at your earliest convenience, and oblige, Sincerely yours,

Wm. J. Richardson, *Secretary.*

THE AMERICAN STREET RAILWAY EXPOSITION AT MILWAUKEE, WIS.

The Twelfth Annual Exhibition of the Association will open on Wednesday, October 18, and close on Friday, October 20, 1893.

It is the intention to make this year's exhibit by far the most interesting of any yet seen. A cordial invitation is extended to all manufacturers and producers of street-railway supplies to exhibit their machinery and wares, if possible in process of manufacture.

RULES AND REGULATIONS.

1. Applications for space must be made on blank forms, one of which is enclosed herewith.

2. Space will be allotted on May 10 to all exhibitors whose applications have been filed with the Secretary, and accepted on or before May 1. Applications for space received and accepted after May 1 will be allotted remaining space, if any, in the order of the acceptance of such applications.

3. The space will be charged for at the rate of ten cents a square foot, and no space less than 100 square feet will be rented, nor more than 2,000 square feet unless by special arrangement with the Secretary.

4. Space allotted cannot be transferred without permission, and must be taken possession of on or before October 17.

5. Articles placed on exhibition cannot be removed without the written permission of the Secretary, except as provided in Rule 18.

6. All goods shipped to the Exhibition should be plainly marked "Street Railway Exposition, Milwaukee, Wis."

7. On and after October 11 exhibitors and their agents and workmen will be admitted to the buildings for the purpose of preparing necessary structures.

8. The general reception of articles for exhibition will commence on October 11.

9. The driving engines will be in operation on and after October 16, and exhibitors of machinery in operation must have everything in running order, in readiness to start their machinery on the morning of the opening day.

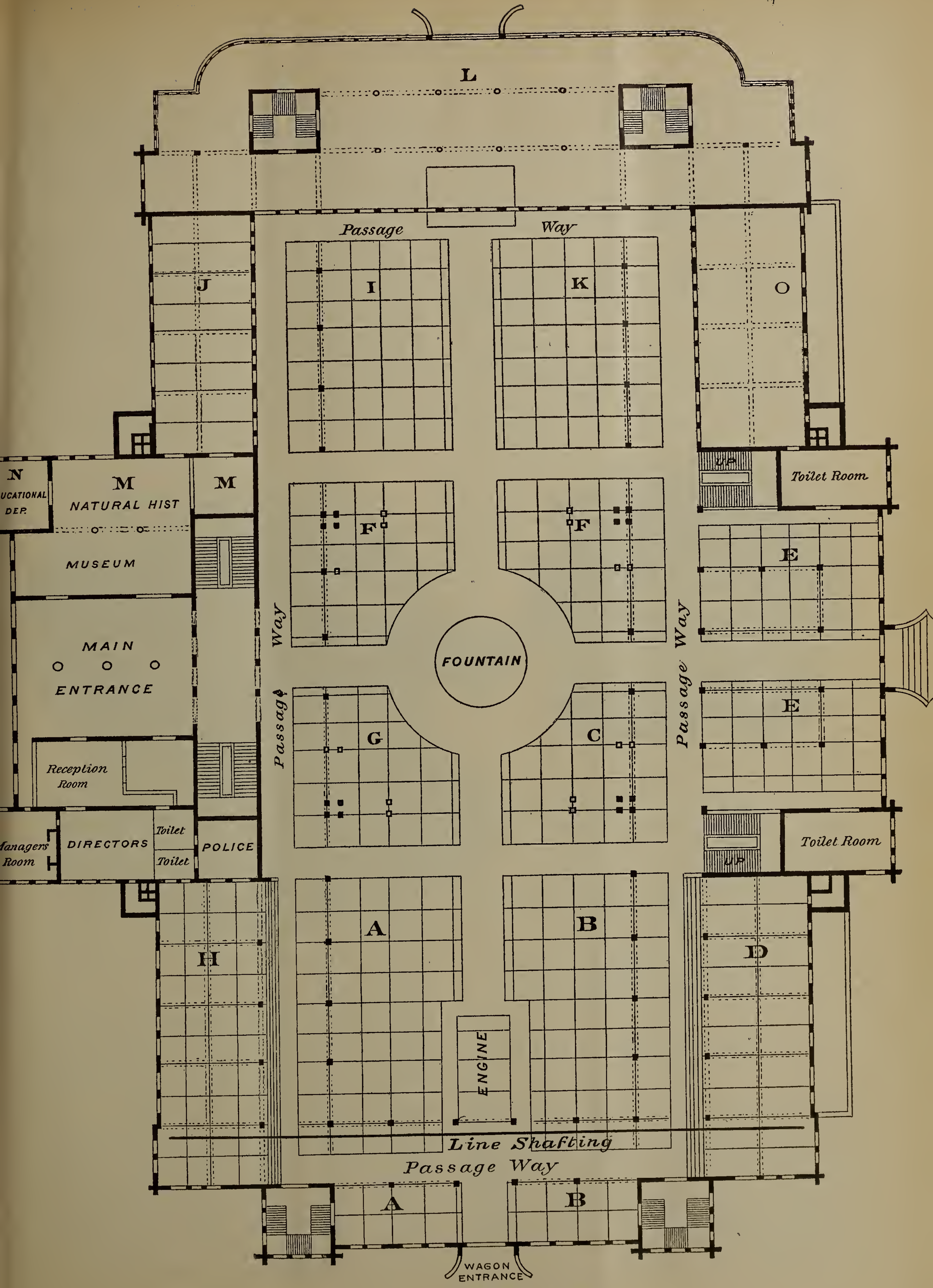
10. All goods intended for exhibition must be on the premises and properly displayed on or before Tuesday evening, October 17.

11. Exhibitors must provide all counter-shafts, pulleys, belting, hangers, etc., necessary for the transmission of power to operate their machinery.

12. No platform or other structure must be nailed to the floors or walls.

13. Exhibitors must not place any sign or circulate advertisements, except such as pertain to their own business (and those only in their own space), without written permission from the Secretary.

14. Steam power and main shafting will be furnished



Each Square in the above Diagram Measures 10 Feet Square.

First Floor Plan. American Street-Railway Association Exposition, Milwaukee, Wis., October 18-20, 1893.

ELECTRICAL AGE, April 22, 1893.

to exhibitors at actual cost, to be charged for pro rata among those who use power. A main steam pipe, with numerous T's for connecting branches, will run through the Hall to furnish steam to those who require it.

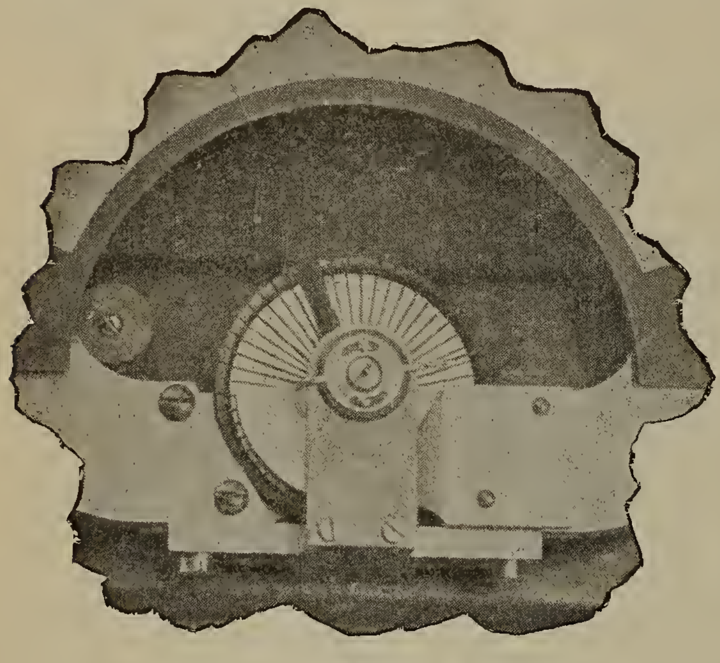
15. The main shafting will not be interfered with or taken apart, therefore exhibitors must provide themselves with split pulleys.

16. All machinery will, if possible, be exhibited in motion, and should be kept in operation at regular work during the hours 9 to 12 A. M., 2 to 6, and 7 to closing P. M.

17. The main shafting is 3½ inches in diameter, and driven at a uniform speed of 162 revolutions per minute. The other lines of shafting are of different sizes, and all driven at a uniform speed of 200 revolutions per minute.

18. Sale Privileges.—Parties desiring to sell and deliver in the building any articles whatever, must first obtain a written permit from the Secretary, for such consideration as may be determined upon.

19. Any permit to sell may be revoked at any time, at the pleasure of the Association.



DISC ARMATURE.

20. Every possible precaution will be taken to guard against fire, and a full corps of watchmen will be on duty day and night; but the Association will not be responsible for loss or damage to articles on exhibition by theft, fire or otherwise.

21. The Association reserves the right to charge an admission fee to the citizens of Milwaukee should it so determine, but the admission of exhibitors and their agents will be free.

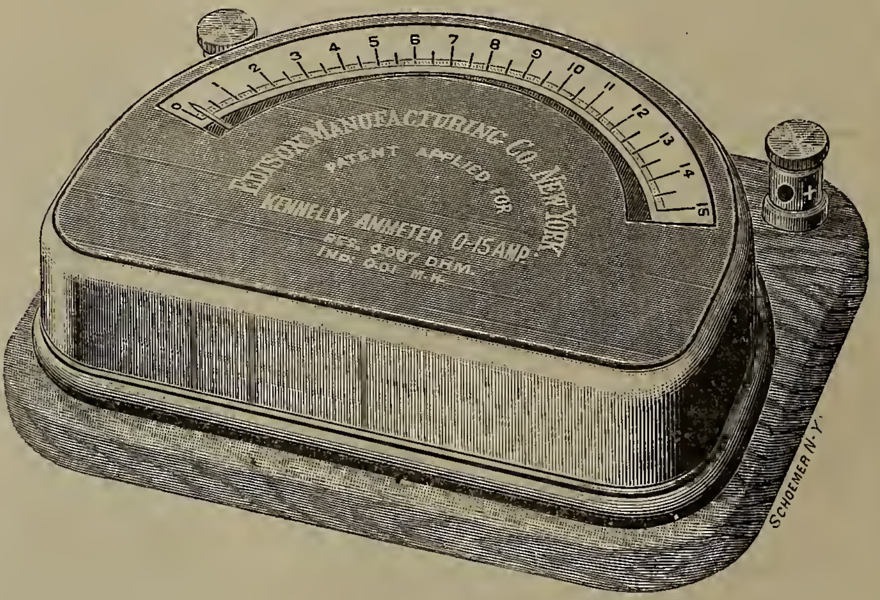
For further particulars address

W. J. Richardson,
Secretary American Street Railway Association,
166 Montague St., Brooklyn. N. Y.

THE NEW STANDARD KENNELLY AMMETER.

This instrument consists of a flat horseshoe magnet with its poles brought out into semicircles facing each other and separated by about $\frac{1}{16}$th of an inch. This large polar surface and narrow air-gap make a magnetic circuit very nearly closed. It is well known that a solid anchor ring of steel uniformly magnetized around its circumference has no demagnetizing force, and therefore no tendency to alter its magnetization. A saw-cut across such a ring introduces an air-gap that establishes a demagnetizing M. M. F. equal to the product of the flux and the air-gap reluctance. As the air-gap broadens, and its reluctance rises, this back M. M. F. increases, making the magnetic condition of the whole circuit more and more unstable, and rendering it more difficult to find a quality of steel that will have sufficient hardness and retentiveness to withstand this demagnetizing influence, while the narrower the air-gap the more permanent and stable the magnetic condition must remain.

In the narrow space between the semicircular pole faces, is pivoted a disk armature, as shown in the accompanying illustration, the plane of the disk being parallel to the polar surfaces and midway between them. Starting from the centre, the insulated wires forming the armature winding are laid radially and symmetrically over the upper surface of the disk, the accuracy of angular spacing being mechanically preserved. One-half of the disk is completely covered by the pole faces, and the other half projects beyond them. Two spiral springs bring the measured current into and from the disk, acting at the same time as a restoring couple, as in the instruments of Cauderay and Gimingham of 1886. When the current passes through the armature, an electromagnetic pull is set up in the plane of the disk, urging it to right-handed or left-handed rotation, according to the direction of the current. As the disk moves in obedience to this force, as many radial wires enter the poles on one side as leave them on the other, so that the electro-magnetic force corresponding to the current strength remains uniform while the retractive force from the spiral springs increases directly with the angle of displacement. In this way the angle through which the disk and its attached pointer move is proportional to the current strength, and the graduations of the scale are nearly uniform. The scale itself is wide and covers an arc of about 125 degrees.



KENNELLY AMMETER.

The shaft bearing the disk is pivoted on agates to reduce friction, and the whole armature complete only weighs a few grams, so that it is not liable to be damaged in transport. The instrument will register in any position, but is most sensitive when resting horizontally. The total absence of iron from the armature ensures freedom from hysteresis or magnetic lag.

The instrument is very light, weighing six pounds in its wooden case. It can be made in any size up to 100 ampères. It is not affected by the earth's magnetic force nor even by the stray field from dynamos beyond a few feet radius. Its resistance and inductance are very low. Its frame is very strong and compact, being supported entirely on the magnet, which is again secured to the base with the intervention of soft rubber washers.

The meters are all adjusted and standardized at the

Edison laboratory, by comparison with the standards there maintained. The scales are read off over mirrors to avoid parallax, and the movements of the needle are practically deadbeat.

No instrument of its type has yet made its appearance in which the magnetic circuit is so nearly closed, and this is the special advantage of the disk armature form.

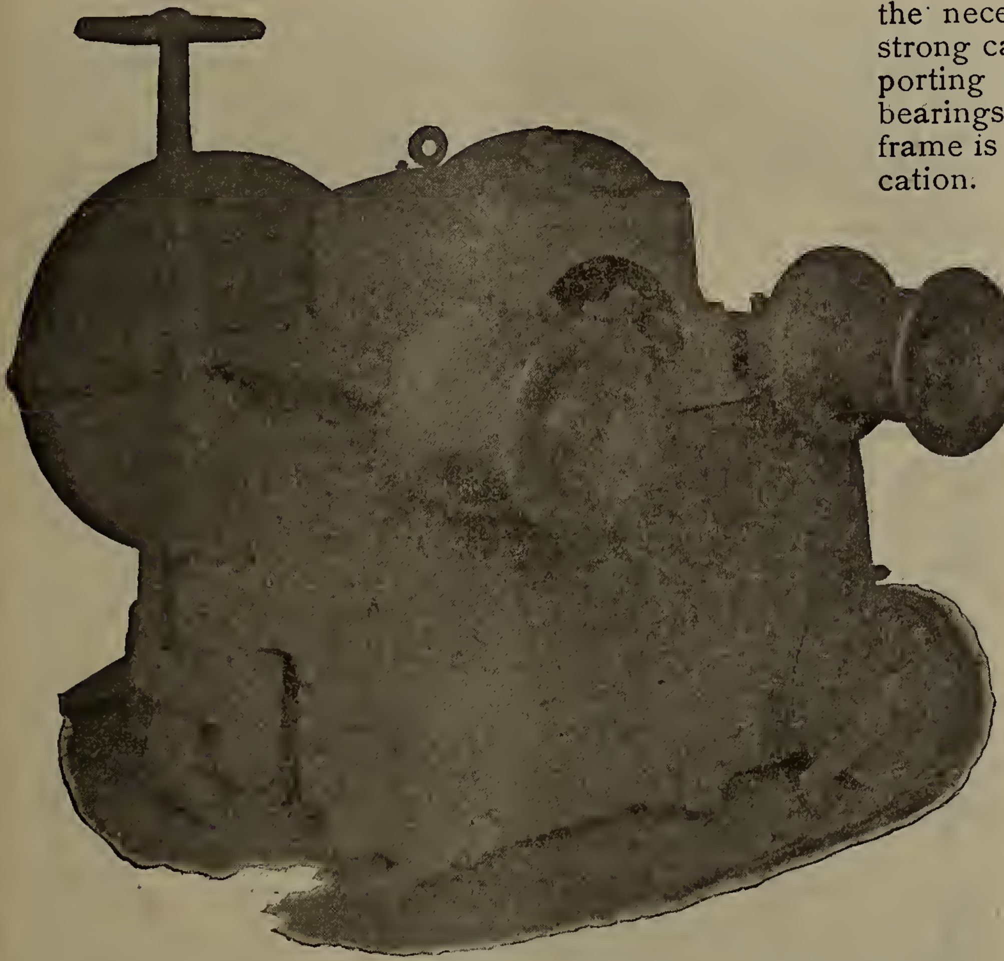
The binding posts are large and strong. The case is handsome, and the workmanship of the highest grade.

A considerable advantage possessed by this form of ammeter is its independence of the distribution in magnetic flux through the armature. If this latter consisted of a spool or compact coil moving from one part of the field to another, under the influence of the current, the electro-magnetic force, and consequently the deviation of the pointer would depend upon the local intensity of field at the point then occupied by the coil, so the accidental variations in the distribution of flux between the poles of different instruments would essentially produce corresponding variations in their scales.

In this instrument however, the winding is spread uniformly over the surface of the disk armature, which is only partly covered by the field, and consequently no movement of the armature within the range of indication can alter the relation between winding and magnetic field, however irregular the latter may be, for as many wires enter the field as leave it; and if any part of the winding is exposed to an unduly great or unduly feeble flux density at the outset, the same number of wires will always remain under that influence throughout the motion. This ensures great regularity in the scales of different instruments, and also ensures a uniformity of any accidental error in the same instrument, all over its scale.

The freedom from tendency to demagnetize owing to the broad polar surface and narrow air-gap, is also a prominent feature.

The instruments are manufactured by the Edison Manufacturing Company, of 110 East 23rd Street, New York City.



ELECTRIC WINCH HOIST.

ELECTRIC WINCH HOIST.

The four-winch hoist for use on wharves and on vessels, is the latest device of this character which the General Electric Company has perfected. It has been designed to meet a growing demand for apparatus which will satisfy the varied requirements of ship and dock work, and it offers special advantages to which the steam hoist cannot lay claim. It is more compact, less weighty, and does not require the special attention of a trained engineer. It can be used in cold weather without the waste of power attendant upon the use of steam by great steam condensation, and there are no burst or leaking pipes connected to it as with hydraulic hoisting apparatus.

For use on shipboard, the winch head hoist is more convenient than the drum hoist as it is better adapted to the variety of hauling and hoisting incident to the manipulation of a ship's cargo. A number of loads may be raised or lowered simultaneously, each winch head being independent of the otheis.

The apparatus illustrated consists of a base frame, a motor, two shafts, each carrying two winch heads, and the necessary controlling apparatus. The frame is a strong cast iron box, open at top and bottom, and supporting on its upper rim the motor and winch shaft bearings, each furnished with self-oiling mechanism. The frame is provided with wheels for convenience of application. The motor is of the latest design and is entirely enclosed by its own frame, with the exception of two small lateral openings which allow of ready access to the brushes and armature bearings and which are closed when the hoist is in operation. It is set in the hoist frame so as to secure a low centre of gravity and great rigidity. The field coil of the motor and winding of the iron clad armature are covered with special waterproof composition.

The winch shafts are of large diameter steel rod, to obviate the possibility of bending under heavy loads. The winch heads are keyed to the shafts over bronze bushings, and the difficulties which rust might create, forestalled. Each winch is provided with two safety pawls, which, when the hoist is in operation, are held out of action by centrifugal force, but which immediately catch into notches provided in the bearing cap, if the current fail while a load is being hoisted. This prevents overhauling of the hoist by the load which might otherwise happen with disastrous results. The apparatus for controlling the hoist is placed below the motor within the frame, where it is protected from mechanical injury and moisture.

The particulars and dimensions of this hoist are as follows:

FOUR-WINCH HOIST, CLASS 60-250, VOLTS 110 (220) (500).

Net H. P. of hoist at winches	45 H. P.
Normal speed of motor	425 Revs.
Voltage of motor, according to order	110-220-500 Volt.
Current at 110 volts	360 Amp
Total weight of hoist, complete	8,000 lbs.
Lifting capacity of hoist—two weights simultaneously	3,000 lbs.
Speed of lifting	250 per minute.
Diameter of winch heads	12 in.
Length of winding space on winch heads	9½ in.

Over-all dimensions of hoist are as follows:

Length	6 ft. 10 in.
Width	6 ft. 7 in.
Height with wheels	4 ft. 7½ in.
Height without wheels	4 ft. 5½ in.

ELECTRIC DECK PLANER.

An electric deck planer has been devised by Mr. Malcolm Sutherland, an electrical engineer of Scotland, and it is in use by a well-known ship-building firm of Dumbarton, Scotland.

The machine, as made and used by this firm for planing the decks of ships built in their yards, is exceedingly simple in construction, and resembles a lawn mower in form, being handled in the same way, and it is stated with as much ease. A steel baseplate is mounted on rollers, and to the underside of this the revolving cutter is attached, whilst the electric motor is placed on top and geared to the cutter by spur wheels, which are covered by an iron guard. The front roller is of the same length as the cutter, so that in passing over the deck it lies on the crests of the uneven parts of the deck and keeps the machine practically level. The hind rollers are set in so that they follow in the wake of the cutter. The machine is fitted with eccentric bearings, and by moving a lever they can be raised or lowered, thus making the cut greater or less as required. The results obtained are very satisfactory, as it is a great advance on hand work so far as regards time, while it relieves the men of a very disagreeable job, as deck planing by hand involves kneeling or sitting on the deck in a most uncomfortable position.

OPENING OF THE COLUMBIAN INTRAMURAL RAILWAY, CHICAGO.

On April 7 a trial trip was made by a train on the Columbian Intramural Railway in the World's Fair Grounds, Chicago, and, it is said, was successful. The following brief description of the road, which is elevated, will be of interest.

It is six and a quarter miles long, and was built by the Columbian Intramural Railway Company at a total cost of $700,000 including power house, rolling stock and everything to make it ready for operation. The fare will be 10 cents for the trip one way or any part of it, and 25 per cent. of the gross receipts go to the exposition. Electricity is the motive force, the trolley system being employed without the use of the overhead trolley. The current runs along a third rail under the car and between the two that carry the wheels. The system is experimental, but it is expected to prove of great value in urban rapid transit. The trains on the intramural elevated are to consist of four cars each, the separate cars being provided with 133 horse-power motors. The front portion of the first car is fitted up as an engineer's cab. The trains will be capable of a maximum speed of thirty miles an hour, but that time will not be made or attempted because of the short distances between stations. The entire trip, from one end of the grounds to the other and back, can be made in twenty-one minutes.

HOW TO CONVERT INCANDESCENT LAMPS INTO GEISSLER TUBES.

In a communication to the *Scientific American*, Mr. E. M. La Boiteaux tells how burned-out incandescent lamps may be used for Geissler tube experiments. This is done in the following manner:

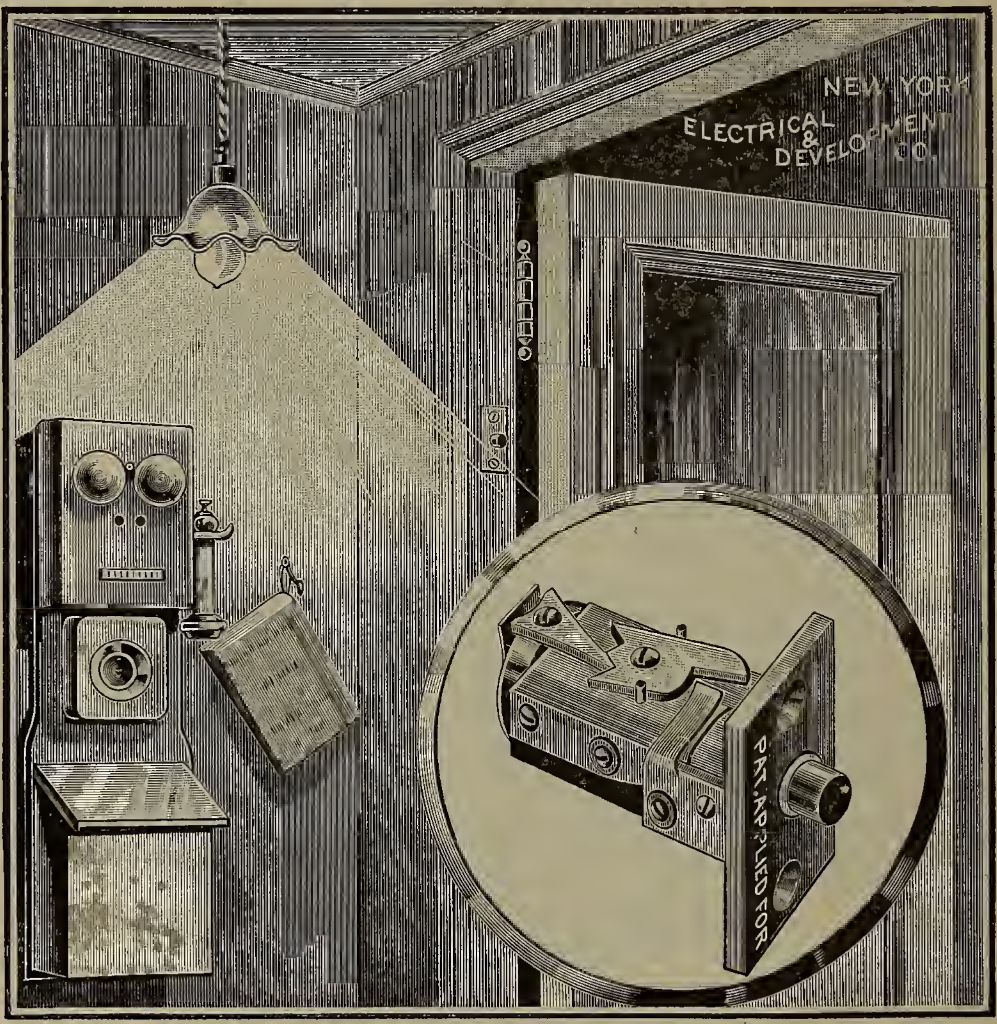
Procure a burned-out lamp, if possible one in which a piece of the filament has been broken off, leaving the ends separated about an inch. Solder a piece of wire to each terminal of the lamp, and connect to the secondary terminals of an induction coil yielding about one-eighth inch spark. Start the coil in action, and holding the globe in one hand begin to file off the glass point where the lamp has been sealed. This operation must be performed very cautiously, using a fine file with a gentle pressure.

The filing should be continued until the discharge diffuses the bulb, and then the point is quickly sealed in the flame. It is, of course, apparent that the object in filing the point is to allow a certain amount of air to enter the globe, producing a low vacuum, through which the discharge will readily pass.

Mr. La Boiteaux has obtained quite a number of beautiful and varied luminous effects in this manner by using the lamps of different manufacture and with very little trouble.

AUTOMATIC ELECTRIC LIGHTER.

In our last issue we gave a brief description of an automatic electric or gas lighter. Since that time we have obtained an excellent illustration of the device which we give herewith. Its application in this case is represented in connection with a telephone booth, though, of course, it is as readily applied to any door leading to a chamber or room of any sort, that is only occasionally used, and where temporary light is required. Among such places may be mentioned, besides telephone booths, cellars, store-rooms, closets, etc., etc.



AUTOMATIC GAS LIGHTER FOR DOORS.

This automatic lighter is an extremely simple device. It is shown in detail in the illustration within the circle, and its application is shown on the jamb of the door. When the door is closed the pin is pressed in, disengaging the arrow-shaped attachment from the notches in the lever of the cut-out. When the door is opened, on entering the room, the spring forces the arrow point into the notch that happens to be immediately in line with it, thereby forcing the lever to one side or the other by pressure on one side of the V shaped notch. If this takes place when the light is turned on the knife-switch is so operated as to open the circuit, which is the position in which it is shown in the engraving.

The door of the booth is now open and the light is on. We will follow the cycle of operations in order to understand the workings of the device. The arrowhead is in the notch on the opposite side to the one in which it is shown in the illustration, and in consequence the knife switch is closed, and the light is on. Now we enter the booth and close the door; by so doing the pin is forced in and the arrowhead is removed from the notch, leaving the switch still "on."

We are through, and emerge from the booth; on opening the door the arrowhead is forced down by the spring into the notch directly under it, which is now the one opposite to that used in the first place, and the point of the arrow in impinging upon the inclined side of the notch forces the blade of the switch out of contact, thus cutting out the light. It should be stated that the arrowhead is pivoted and always assumes a position parallel with the axis of the pin, when it is not pressed into one of the notches; when it engages the notches it is thrown out of line by the motion of the notch to one side or the other, but as soon as the arrowhead is released from its position it assumes a parallel position, and is ready to engage in the next notch.

It will be understood from this description of the operation of the apparatus that the device is a very simple and effective one, and never fails to act. It should find a very large sale, as it is a decidedly useful labor-saving instrument. It is manufactured by the New York Electrical and Development Company, Messrs. Stanley & Patterson, 32 Frankfort street, being the selling agents therefor.

CAN A PRACTICAL ALL SOLID INCANDESCENT LAMP WITHOUT VACUUM BE MADE?

By F. M. F. Cazin.

(Continued from page 215.)

The answer to this query cannot possibly be other than that vacant space cannot retain heat, but inert gas can, and that the glass can and will retain heat to a higher degree than gas, in effect, increasing the volume of matter in contact and eventually lessening the surface exposed to cooling. In the case of an intermediate space filled with inert gas, we find a certain percentage of non-luminating heat radiation absorbed by the gas, increasing its temperature, and lessening the speed with which such heat leaves the incandescent matter. As long as the gas is colorless, that is, as long as light rays of any or all colors are not retained by it, the temperature of the incandescent matter will not be increased by the light rays proper, but the portion of radiation that is dark will in part impart heat to the enclosing gas and thereby create or maintain a higher degree of luminosity, and at all events such luminosity will be thereby maintained under more favorable conditions than in the vacuum lamp.

The dark heat rays thus absorbed cease to be radiant heat, and will in consequence, have to be diffused into space by contact, viz.: will have to be compensated for by surface cooling, or otherwise they would accumulate to a degree dangerous to the globe. With the same area of cooling surface as the vacuum lamp possesses, the inert gas lamp fills automatically this requirement. The surface in the latter case will maintain a higher temperature, and the cooling action, the effect of which increases with the difference in temperature between the source of heat, viz.: the lamp, and the cooling agent, the air, will thus compensate by more rapid surface cooling for the diminished direct heat radiation. What has been said in relation to the lamp where the intermediate space is filled with inert gas also applies though in a higher degree, to the lamp where the intermediate space is filled with a solid transparent at least impart.

But we find even then, that it is not the quantity of matter contained in a given space or what is the same, that it is not the density of matter which increases its faculty for retaining the dark heat rays. Rock salt ($\delta = 2.13$) retains almost no dark heat rays, while ice, ($\delta = 0.98$) retains them almost completely, and flint glass ($\delta = 2.3$) retains of the different heat rays (O_7 to O1) an average of 0.498 or very nearly one-half, while the other half passes by radiation pure and simple without increase of temperature.

Magnus has demonstrated, that of a relative heat quantity of 100 passing through a vacant space without being decreased in its progress, 1.12 per cent. was absorbed by air and 61.12 per cent. was absorbed by ammoniacal gas under normal atmospheric pressure. When solids were considered, Malori, Masson and Janin found that dark non-luminous heat rays were all retained by ice and that almost none were retained by rock salt. This leads to the conclusion, that if incant descent matter is imbedded for its protection agains-combustion in a coat of glass, an adequate space around such glass and inside of a surrounding globe, similar to that of the vacuum lamp, might be filled with rock salt with practically the same effect as that of the vacuum lamp, thus constituting, if its manufacture be practicable, an all-solid-lamp of good quality.

When an all-glass-lamp is considered, we have the following facts to deal with:

(a) That of the total heat produced by electrical incandescence 10 per cent. radiate as light without increasing the temperature of the lamp body but increasing the temperature of the surrounding atmosphere.

(b) That one half of the remainder of heat produced (45 %) that is, of the non-luminating or dark heat rays, passes through glass of 8 mm. in thickness, without increasing its temperature in excess of the temperature of the surrounding atmosphere.

(c) That of the 55 per cent. of the 15.36 gm. calories produced by the 16-candle power lamp, 8.448 gm. calories per second pass the all-glass body of the lamp without materially increasing its temperature, as long as its thickness is not in excess of 8 mm. *

(d) That the remaining 6.912 gm. calories per second must be compensated by surface cooling in order to protect the glass against accumulation of heat and against the damaging effect of the same.

The difference between the vacuum lamp and the all-glass lamp in relation to all these points consists, after all, only in the different thickness of glass that the all-glass lamp would have, were the same area of surface secured.

Here we meet with alternative possibilities. If the surface and, in consequence, the volume of glass be lessened, the heat quantity to be compensated by surface cooling must proportionally increase, but if the surface quantity is maintained and the glass volume is proportionally increased, the question arises, whether the proportion of heat retained and radiated is modified by the increased thickness of glass. Indeed we find that various thicknesses of glass retain the percentage of radiated heat as follows:

2 mm.	38.1	per cent.
4 mm	42.4	"
6 mm	44.2	"
8 mm.	45.1	"
13.5 mm.	63.7	"
27 mm.	70.6	"
54 mm.	73	"
71 mm.	74.3	"
108.27 mm.	75.6	"

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* Mallori (Poggend. Am. Vol. XXXV) found for a thickness of 0.00827 m. that 54.9 per cent. of heat passed, and 45.1 per cent. was retained.

The distance from incandescent matter to surface in the vacuum lamp is not in excess of 27 mm. It therefore follows that the heat-retaining capacity of the all-glass lamp is about twofold, compared with that of the vacuum lamp, and that the temperature of the lamp body will remain at twice the difference above the air temperature, when compared with the vacuum lamp, in order to maintain the proportionate increased cooling, while the total heat produced by either is the same.

Doubt cannot be reasonably sustained, that no material inconvenience will result from the increased temperature of the solid globes, as long as the total heat produced is consumed, though it be, as far as dark rays are concerned, in a higher proportion than is the case with the vacuum lamp, by contact or surface cooling. We are able to approximately determine the degree of temperature to which the surface of the solid glass globe will be heated.

The surface of the Edison 16-candle-power globe is very nearly 18.85 square inches. As the heat production amounts to 15.36 gm. calories per second, the cooling power of the lamp amounts to the compensation of $\frac{15.36}{18.85} = 0.814$ gm. calories per second per square inch, both by radiation and differential contact. But of the total 15.36 gm. calories per second in the case of the Edison lamp, only about one-third increases the temperature of the glass globe, while the other two-thirds pass through by radiation without increasing its temperature. Therefore, the actual differential surface contact cooling absorbs only $\frac{0.81}{3} = 0.27$ gm. calories per second per square inch.

In the case of the all-glass-lamp where 70.6 per cent. of the total heat falls to surface contact cooling $\frac{15.36 \times 70.6}{18.85 \times 100} = 0.575$ gm. calories per second per square inch—twice the heat quantity has to be absorbed by surface contact cooling. The Edison globe is not known to attain boiling heat in a surrounding temperature of 60 degrees F.

If the all-solid lamp has its total surface increased to that of the vacuum lamp by adopting a method similar to that applied, for optical reasons, to the vacuum lamp, by means of a second or inclosing globe, the heat quantity falling to the square inch of surface per second, and consequently the temperature of surface, will evidently not be in excess of that of the vacuum lamp. But with an equal surface the temperature would not reach 200° or 230° C., the melting point of tin, much less 525° C., the point at which trisilicate potash glass begins to glow, fusing at 1,500° C. The temperature of the incandescent matter itself is rarely above 1,200° C., and only by excess of current does it reach 1,300° to 1,500° C.

The actual effect of a current such as required and ordinarily employed demonstrates that when a film of opaque glass immediately covers the filament and is itself surrounded by transparent glass the effect to the human eye is such, that the volume and size of incandescent matter appears enlarged and comparatively more brilliant while the surface remains transparent and unchanged. Hence an increase of luminous effect results for a given energy applied. Rapid and excessive changes of temperature alone interfering; otherwise a steady uniform cooling action takes place the same as in the vacuum lamp. The three questions propounded appear then as answered in a manner favorable to the all-solid incandescent lamp.

In view of the conditions contributive to higher effect a longer life and for avoiding the fragile filament, of the artistic possibilities under the new conditions it is not without good cause that those who have had opportunity to study the all-solid or all-glass lamp, see in it the incandescent lamp of the future?

Patents covering all the new points mentioned have been recently applied for.

ELECTRICAL SOCIETIES.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The seventy-sixth meeting will be held at the headquarters of the Institute, 12 West 31st street, Tuesday, April 18, at 8 P. M. The paper to be presented is entitled "Impedance." by A. E. Kennelly, of the Edison Laboratory, Orange, N. J. The annual meeting of the institute, for the election of officers, etc., will be held at the same place, Tuesday, May 16. The general meeting for the reading and discussion of papers, will be held the following day. The official ballots with instructions concerning the same have been mailed to members. The "council nominees" are as follows: For President, Thomas D. Lockwood; for Vice-Presidents, H. Ward Leonard, Patrick B. Delany and Edwin J. Houston; for managers, Charles Hewitt, W. J. Hammer, Harris J. Ryan and J. J. Carty; for Treasurer, Geo. M. Phelps.

A "member's ticket" is also offered, with the following names: For President, Edwin J. Houston; for Vice-Presidents, H. Ward Leonard, P. B. Delany and William Wallace; for Managers, Charles Hewitt, Wm. J. Hammer, Harris J. Ryan and J. J. Carty; for Treasurer, George M. Phelps.

It is desired that all members shall at once return their ballots and not allow the matter to remain unattended to.

FIRST ANNUAL REPORT OF THE GENERAL ELECTRIC COMPANY.

Following is the full text of the first annual report of the directors to the stockholders of the General Electric Company, with the condensed balance sheet omitted.

The General Electric Company was incorporated April 15, 1892, and began active business on the first day of June, 1892; so that the report presented by your Directors, at this meeting of stockholders, covers a period of eight months ending January 31, 1893.

As you know, the General Electric Company acquired in exchange for its stock practically all the capital stock of the Edison General Electric Company, of the Thomson-Houston Electric Company, and of the Thomson-Houston International Electric Company. These three corporations, referred to hereafter in this report as the underlying companies, still retain their independent corporate existence. The first two continue their manufacturing business as before, the General Electric Company purchasing and distributing the chief part of the apparatus manufactured by them. The various selling and many other departments of the Edison General and Thomson-Houston companies have been gradually merged into corresponding organizations of your Company.

The difficulties inherent in such a reorganization were many and serious, and we feel that the stockholders are to be congratulated that, largely because of the zeal and hearty co-operation of the former officers and employés of the Edison General and Thomson-Houston Companies, it has been carried through to a complete and successful issue.

LOCAL LIGHTING AND RAILWAY COMPANIES.

While your Company has about 6,000 customers included in the different departments of its business, the interesting and important development is in the direction of local lighting and railway enterprises.

The following information, with respect to local illuminating and electric street railway companies using your apparatus, will be of interest to the stockholders.

LIGHTING COMPANIES.

The total number of such central station companies using Edison and Thomson-Houston apparatus is 1,277, supplying about 2,500,000 incandescent and about 110,000 arc lamps.

The growth of these companies has been phenomenal and it is very satisfactory to note that those which have been established longest are making the most rapid increase in size of plant and volume of business.

During the past year there has been a very marked appreciation in the value of the securities of local companies, especially in the larger cities, testifying to the increased confidence of investors in such properties.

RAILWAY COMPANIES.

	Feb. 1, 1891	1892	1893
Total number of roads operating and under contract..	151	214	435
Total number of cars in actual operation..............	1,578	2,790	8,386
Number of miles of road in actual operation.........	1,252	2,315	4,927

During the past eight months there has been a notable increase in the size of individual machines manufactured at the different factories, as well as a large increase in the total factory output.

On February 1, 1892, the largest power-generator manufactured was of 275 h. p. Machines of 2,000 h. p. each are now being manufactured by your company, seven of which are already sold for early delivery. The largest lighting generators in use February 1, 1892, were capable of supplying only 2,000 incandescent lights each. There are now being constructed generators of the direct-coupled type with a capacity of 12,000 incandescent lights each. Many local lighting stations are being equipped with steam engines directly coupled to such machines, giving a capacity of about 25,000 incandescent lights from each engine.

Of the largest direct-coupled lighting generators which were manufactured a year ago, there were shipped during the year 1892 an aggregate of 7,000 h. p. Of such sizes now being constructed there are at present on order 8,000 h. p.

Machines for power purposes (principally railway) aggregating 40,000 h. p., have been shipped during the past year. There are now being manufactured, on order, generators aggregating 37,000 h. p,, or practically as much as the total shipments for the past year.

Most satisfactory progress has been made in the development of apparatus for mining purposes, particularly of locomotives for haulage work in coal mines. Thirty of such locomotives, with a very large amount of other mining material, are now under construction at the works.

The efforts of many of your best engineers have been directed for some time to the production of electric locomotives for which we now have numerous orders for haulage and general railway purposes. Two locomotives of 1,600 h. p. each, ordered by one of the principal trunk lines, are now under construction and nearly ready for use. The equipment of the elevated electric railway at the World's Fair, six miles in length, and which is now nearly completed, is being supplied from the Schenectady factory, and it is hoped will be in operation at the opening of the Fair.

LICENSEES.

The relations between your company and its various licensees, and between it and those of the underlying companies, are of the most satisfactory character. Your directors appreciate that the interests of the company are closely connected with the welfare of its licensees, and there is a corresponding recognition on the licensees' part that the cordial co-operation of your company is essential to the fullest development of their business.

No effort will be spared to secure from the recent patent decisions in your favor the greatest possible benefit to these licensees. The public, through them, will be distinctly benefited, because of the concentration of local illuminating and power business in the licensed central stations equipped for supplying light and power at minimum rates.

The prices at which apparatus and lamps are now furnished by the General Electric Company, for use of such stations, are in many instances lower than those which prevailed prior to sustaining the lamp patent, while the quality and efficiency of the apparatus are largely increased. Thus the licensees are enabled to cheapen their production and their prosperity is greatly enhanced—a prosperity in which your company has a direct and permanent share.

PATENTS.

The patent situation is encouraging and promising. The decision of the highest court sustaining the fundamental incandescent lamp patent, which decision has been followed by many other tribunals, has vested in your company the right to the incandescent lamp business of the United States, a result of great value to the company.

The strenuous efforts made by your competitors to develop an incandescent lamp which will not infringe this patent have been thus far wholly without success, and there is no reason to believe that any different results will be achieved in the future.

The decisions heretofore rendered in favor of the Thomson-Houston and Brush companies, covering the double carbon arc lamp, automatic current regulation and electric storage are of very great value to your company.

Although it is well known that the patented inventions of Edison, Thomson, Brush, Van Depoele, Rice, Sprague, Bentley, Knight and other inventors now or heretofore connected with your organization are the basis of substantially the entire arts of electric lighting, electric railways and electric motive power now in general use, the situation up to the date of the organization of the General Electric Company was not favorable to the best development of business under these inventions.

Suits against infringers are now in active progress on many important patents other than those already sustained by the Courts, covering essential features in electric railway, lighting, and power apparatus. These suits will be pushed as vigorously as possible.

In dealing with the numerous past infringers, your Directors are of the opinion that the substantial interests of the shareholders can be protected without a harsh or offensive exercise of your rights, and in such way as to greatly benefit the Company and to satisfy consumers and the public of its desire to act in an entirely fair and liberal spirit.

FINANCIAL.

There are annexed to this report the company's condensed balance sheet and statement of profit and loss as of January 31, 1893, showing that in the eight months during which your Company has been in operation its profits amounted to $1,024,954.59 in excess of three quarterly dividends on the common and one semi-annual dividend on the preferred stock.

In order that the stockholders may understand the position of the Company, the following explanation as to the general character of the items in the balance sheet is submitted.

INVESTMENT ACCOUNTS.

Under this head will be found the assets now represented by the stocks of the three underlying companies, substantially all of which have been acquired by your Company.

Details in regard to these companies will be found on page 8 from which it will be noticed that the basis upon which they were acquired by your Company represents a cost of about $8,000,000 for all their patents, other valuable rights. licenses and other contracts. This is after writing down the assets they still own—manufacturing plants, factory inventories, etc —to conservative valuations.

The transactions of your Company are to a considerable degree with local companies working under contracts licensing them to use the patents, about two thousand in number, under which your Company operates. Your Company is now supplying apparatus to about thirteen hundred local companies, the royalties from which run from $1,500,000 to $2,000,000 per year. It is believed that the royalties will be greatly increased in the future, so that $8,000,000 would appear to be far within the actual value of the patents, contracts, etc., which are represented thereby.

Your Company has to a large degree acquired the business, other than manufacturing, of the Thomson-Houston and Edison General Companies, and has liquidated a large part of their liabilities. This course will be continued during the present year.

The preferred stock of the United Electric Securities Company, has been sold since the close of the fiscal year at a price in excess of the value at which it appears in the balance sheet. The common stock of the same company—$825,500 out of a total issue of $1,000,000—is taken in the balance sheet at par. The company is making large profits and paying regular quarterly dividends.

The stock of the Canadian General Electric Company, a manufacturing and selling company controlling the Edison and Thomson-Houston patents in Canada, is taken at par. Its sale at an early date is expected, it being now under option to a Canadian syndicate at above par.

The stocks of the Fort Wayne Electric Company and Northwest General Electric Company are paying eight per cent. dividends on the value at which they stand in the balance sheet.

Stocks of "Miscellaneous Companies" carried at $71,566, comprise holdings in various corporations not considered local or licensee companies.

OTHER ASSETS.

With reference to these items it may be stated that in the judgment of your Board they are taken at safe figures. They consist of stocks, bonds, cash, notes and accounts receivable, merchandise on hand and work in progress; and it will be noticed that they amount to $29,559,600.61 as against total current liabilities of $5,246,219.

The stocks of local companies, which appear in the balance sheet at $5,772 622 80 (par $11,362,011.65) have been valued carefully with the intent to carry them at a figure which can easily be obtained for them.* As a further margin in this respect, stocks amounting at par to $1,301,940 (most of which accrued to this Company under license contracts with recently organized companies) are taken in the balance sheet at the nominal value of $1.00 for each block, although there is reason to believe that within a moderate time these will develop a substantial earning capacity.

The bonds are almost entirely those of local companies. They are nearly all first mortgage bonds, payable in gold, and stand in the balance sheet at about seventy per cent. of their face value. All of these bonds excepting $439,000 at par value—$251,088.07 book value—are regularly paying their interest, and the comparatively small amount in default is carried at prices lower than it is believed will be realized.

Some of the bonds carried in the balance sheet have been sold since the close of the fiscal year at prices in excess of their book value, and the rest will be sold from time to time through the United Electric Securities Company and other channels as heretofore.

The amount now accruing to your Company as dividends (exclusive of those received on the stocks of the underlying companies) and as interest from its holdings of stocks and bonds shown in the balance sheet exceeds the amount required to pay interest on your Company's $10,000,000 outstanding debenture bonds.

After careful examination, deductions have been made from the notes and accounts receivable to cover fully all bad and doubtful items.

The item "Inventories" represents all the Company's stock of apparatus, material, machinery, fixtures, etc., in the offices and storehouses of your Company's seven districts, and includes the machinery, tools, and material in the various repair shops connected with such District Offices.

"Work In Progress" represents the actual cost to date of all labor, material, etc., on unfinished contracts now in course, which, when completed, will afford a considerable profit.

The cost of patents acquired by your Company during the eight months has been charged off as an operating expense.

CONTINGENT LIABILITIES.

Your Company makes a practice of endorsing and discounting some of the notes it takes from its customers. Such endorsed notes are not included in notes receivable in the balance sheet where only those now held by your Company are taken into account. The outstanding notes receivable which had been endorsed and discounted on January 31, 1893, amounted to $3,787,312.69.

C. A. Coffin, *President.*

By order of the Directors.

UNDERLYING COMPANIES.

EDISON GENERAL ELECTRIC CO.

The cost of acquiring 149,699 shares of the capital stock of the Edison General Electric Company was	$14,969,900 00	
Less net amount credited to that Company, after charging it with money advanced, and with an arbitrary amount of $695,000 as a guarantee against its customers' notes and accounts transferred to the General Electric Co., and after crediting it with sundry assets taken over by this Company	6,336,691 54	
Making present cost, as shown on the Balance Sheet		$8,633 208 46
This amount represents the following:		
Manufacturing Plants being the investment in lands, buildings, machinery and tools at Schenectady, N Y., and Harrison N. J.	$2,677,548 09	
Machinery and materials sold to U. S. Wire and Cable Co. but not yet paid for	282,147 76	
*Schenectady and Harrison Factory Inventories	2,576,887 14	
Cash and Notes and Accounts Receivable	409,117 86	
Total	$5,945,700 85	
Less Debt	1,551,660 71	4,394,040 14
Leaving		$4,239,168 32

represented by Patents which have cost the Edison Company about $2,000,000; and by holdings of the entire capital stocks of Edison underlying patent owning companies, under contracts with which all large Edison Licensees give to the Edison Company a percentage of their entire issue of stocks and bonds.

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* Included in this amount are shares of the Edison Electric Illuminating Companies of New York, Boston, Brooklyn, Philadelphia and Chicago of a par value of $2,625,300. The present market value of these stocks is in excess of $3,400,000, although taken in the balance sheet at $3,024 695. Besides these there have been acquired, in the usual course of business, shares of one hundred and thirty-seven other companies, a large part of which will probably be disposed of through the ordinary channels.

THOMSON-HOUSTON ELECTRIC CO.

The cost of acquiring 399,347 shares of the capital stock of the Thomson-Houston Electric Company was		$18,381,970 00	
Less net amount credited to that company, after charging it with money advanced, and with an arbitrary amount of $1,000,000.00 as a guarantee against its customers' notes and accounts transferred to the General Electric Co., and after crediting it with sundry assets taken over by this Company		9,965,118 22	
Making present cost, as shown on the Balance Sheet			$8,416,851 78
This amount represents the following:			
Manufacturing Plant, being the investment in lands, buildings, machinery and tools at Lynn, Mass		$1,240,066 77	
*Lynn Factory Inventory		2,263,347 59	
Cash and Notes and Accounts Receivable		428,126 91	
Raw copper		135,525 94	
Consignments		8,396 71	
Stocks of the Brush, Excelsior, Fort Wayne and Schuyler Electric Companies, and stocks of other manufacturing and patent owning companies (par value $7,312,980) carried at	$4,013,420 11		
Stocks of the Central Thomson-Houston, Eastern Electric Construction, Northwest General Electric, Thomson-Houston Electric Light and Thomson-Houston Motor Companies (par value $1,468,350) carried at	891,750 00		
	4,905,170 11		
Liquidation value, say		2,500,000 00	
		$6,575,493 92	
Less Debt		1,547,964 21	5,027,499 71
Leaving			$3,389,352 07

represented by patents, including Brush patents on double carbon arc lamps, storage batteries and patents on current regulation, all of which have been sustained in the United States Courts, and by about 1,400 other patents owned by the Thomson-Houston Company and manufacturing companies controlled by it.

THOMSON-HOUSTON INTERNATIONAL ELECTRIC COMPANY.

The entire capital stock of the Thomson-Houston International Electric Company was acquired at a cost, as shown on the Balance Sheet of		$1,212,000 00
This amount represents the following:		
Stocks of Other Companies	$ 13,139 00	
Cash and Notes and Accounts Receivable	468,076 02	
Charges against its Branch Offices	468,944 69	
Inventory and Consignments	39,049 98	
	$989,209 69	
Less Debt	307,953 32	$681,256 37
Leaving		$530,743 63

represented by the rights in foreign countries under patents of Thomson, Rice and others, including contracts for delivery of $100,000 stock of the Canadian General Electric Company and substantial interests in other manufacturing and exploiting organizations in foreign countries.

The condensed balance sheet shows the company's assets to be $50,934,973.59, and the total liabilities $49,909,839 00, leaving a surplus of $1,024,954.59 The profit and loss account shows net earnings of $3,356,593.10, and expenses $2,331,638.51.

The directors of the Company are: F. L. Ames, C. A. Coffin, T. J. Coolidge, Jr., C. H. Coster, T. A. Edison, Eugene Griffin, F. S. Hastings, H. L. Higginson, D. O. Mills, J. Pierpont Morgan and H. McK. Twombly.

PRACTICAL WELDING OF RAILS.

The Johnson Company of Johnstown, Pa., has brought out an electrical track welder, which is said to be highly successful The machine welds the rails together as they lay on the sleepers, in a very few minutes. It is, we understand, run over the rails and stopped at the joints, then the proper electrical contracts are made, and the current turned on. When the ends of the rails become white hot they are pressed together and the weld is complete.

BANQUET TO W. J. DEALY.

A complimentary banquet was tendered to Mr. Wm. J. Dealy by the employés of the general operating department of the Western Union Telegraph Co., New York, at the Central Opera House, New York, Tuesday, April 11. Fully four hundred prominent people in telegraph circles were present to testify to their appreciation of Mr. Dealy's popularity and congratulate him on his promotion to a superintendency. Ladies to the number of one hundred were also at the banquet tables. Speeches eulogistic of Mr. Dealy's telegraphic career and his life work were made and Mr. Dealy in responding stated that his success in life and business was achieved by his constant endeavor to do his work promptly and correctly and to be always on time.

WM. J. DEALY.

A SPECIMEN OF LEGISLATIVE IMBECILITY.

BY ALLEN R. FOOTE, TAKOMA PARK, D. C.

The following is the text of *An Act* that is "now before the House Committee on Corporations" in the Legislature of one of the most important States in the American Union. As a specimen of utter ignorance of the subject attempted to be dealt with, or of absolute dishonesty, I think it may safely challange any Legislature to show its superior.

"Be it Enacted, That no individual, partnership, association, company or corporation, now or hereafter organized or existing under any of the laws of the Commonwealth, or organized or existing under the laws of any other State or Territory of the U. S., or any foreign country, and doing business within the Commonwealth, and engaged in supplying to the public, light by means of electricity, in any county, city, town or borough, or townships, within this Commonwealth or any part or parts thereof, shall charge, collect or receive any larger or greater sum or compensation of any character whatsoever, for light so supplied by him, then in it respectively, than as hereinafter set forth, to wit:

"For light supplied for public lighting in any of the said cities, towns, boroughs or townships of this Commonwealth, in part or part thereof, the sum of 25 cents per day of 24 hours for each arc lamp, and for light supplied to individuals for private lighting in each of said cities, towns, boroughs or townships within this Commonwealth, in parts or parts thereof, the sum of 25 cts. per day for each arc lamp, or ¼ cent per hour for each incandescent lamp.

"Sec. 2. Any individual or partnership who shall charge, collect or receive for light furnished by him or them as aforesaid, any sum or compensation whatsoever in excess of the rate fixed by the act, shall be deemed guilty of a misdemeanor, and on conviction shall be sentenced to pay a fine of not less than $100.00 or more than $1,000, at the discretion of the Court.

"Sec. 3. Any officer, director, agent or employé of any association, corporation or company as aforesaid, who shall charge, collect or receive for the light so supplied as aforesaid, any sum or compensation of any nature whatsoever in excess of the rates aforesaid, or who shall knowingly receive or permit the association, company or corporation of which he is an officer or director, to charge, collect or receive for the light so supplied as aforesaid by the association, company or corporation of which he is such officer, or director, any greater sum or compensation whatsoever in excess of the rates hereinbefore fixed, shall be guilty of a misdemeanor, and on conviction shall be sentenced to pay a fine of not less than $100.00 or more than $1,000, at discretion of the Court."

---

* Raw materials, materials in process of manufacture with labor thereon added, and finished apparatus in stock, ascertained by actual inventories figured on liquidating values, *i. e.* raw material at *present* cost prices, apparatus finished and in process of manufacture at cost of labor and material, and obsolete apparatus at "scrap" value.

An examination of this measure will disclose the fact that it was prepared by a person who must accept, measured by the evidence here given, the position of illiteracy, or what is more likely, of a willingness to purchase cheap notoriety by appearing to attack monopolies for the benefit of the masses. In either position, he is a disgrace to the constituency he represents, be it as ignorant or dishonest as it may.

Were it not for the fact that there are large numbers of imperfectly informed, but well meaning people who are unfortunate enough to be influenced, and in a certain sense represented by such imbeciles, their exhibitions of ignorance or dishonesty would not be worth noticing. It is with the view of showing those who have elected this representative what an error they have made, that time may be spent in criticism of this remarkable production.

Section 1 fixes the price of public lighting at "25 cents per day of 24 hours for each arc lamp," but makes no mention of the price for incandescent lamps used for public lighting. It does not specify whether or not the "day of 24 hours" shall be 24 consecutive hours although the term "day" is a unit of consecutive time. It does not specify what the charge shall be for any less time than "a day of 24 hours," nor does it specify any different price for an arc lamp using 450 watts of current and one using 120 watts. An act declaring that ¼ peck and a full peck of potatoes should sell for the same price, would be as intelligent or as honest as this. In fixing the price for private lighting the same defect regarding the amount of current consumed by arc lamps occurs with the added defect of omitting the number of hours to constitute the "day" for which the charge of 25 cents is to be made. For private lighting the price of incandescent lamps is fixed at "¼ cent per hour for each incandescent lamp," regardless of the fact that the candle power of incandescent lamps now in use ranges from 16 C. P. to 150 C. P. with a dozen intermediate grades. Under this act as drawn, those using 150 C. P. lamps would pay but ¼ cent per hour the same as those using 16 C. P. lamps. This is about as intelligent as the saying of the old woman who declared that "a pint is a pound the world around" and sold shot and feathers by the pound, using a pint measure with which to establish her unit of weight.

Sections 2 and 3 fix the penalties to be exacted by order of Court from "any officer, director, agent or employès of any association, corporation or company," for making collections for lighting service "in excess of the rates hereinbefore fixed."

It is a fundamental principle of common law in all civilized communities that property shall not be taken for public use without just compensation. The destruction of the power to use property profitably is a confiscation of the value of the property. The fundamental principle that governs all legislative power to in any way fix the price that any corporation, firm or person may receive or collect for a service rendered, is that all compensations so fixed shall be just. No compensation is just that does not provide for all cost of fixed charges, maintenance and operation *and* a reasonable profit. Any law that fails to fulfill such requirements must fail to be enforced by the courts or to be upheld by a correctly informed public opinion.

No better lesson could be given the constituency that is responsible for the presence of this incompetent representative in the State Legislature, than to allow his act to become a law with an amendment added providing that every company, firm, or person complying with the act shall be entitled to collect from the State the full amount of the loss so caused together with all costs of collection, that the State should be reimbursed by the collection of a pro rata poll tax to be levied upon every voter who aided and abetted the destruction of the value of property by having voted for the person who introduced the act in the legislature. It is my opinion that under such conditions this representative would not be able to show that a sufficient number of persons voted for him to entitle him to his seat.

The days are passed in which intelligent people believe that "the king can do no wrong." The day has come in which intelligent people do not believe that representatives in councils, legislatures and the national congress can do no wrong. When the day shall come in which a legislator can be held responsible for the damage done by his ignorant or dishonest acts, as individuals are now held for all crimes committed in ignorance or defiance of the law, civilization will be induced to take rapid and long strides of progress.

A democracy cannot serve the welfare of the people beyond the limits of the intelligence and honesty with which their votes are cast.

NOTES OF GENERAL INTEREST.

The building of the Glens Falls Insurance Company, Glens Falls, N. Y., is being wired for the electric light.

The report of the Dunkirk, N. Y., municipal electric light service for March shows the cost of light per hour to have been 1.62 cents.

The Electro-Dynamic Company, on April 10, filed a libel against the electric launch "Electron" to recover $2,000, alleged balance due on account of storage batteries furnished by the company in 1891. A decree was rendered in favor of the company.

The Mobile Electric Railway and the Mobile Light and Power Company have consolidated under the name of the Mobile Light and Railway Company.

The Sperry Electric Company has moved its headquarters to Cleveland, Ohio.

A new storage battery is to be tested in lighting the passenger trains on the Southern Pacific Railroad. Mr. Boyd Anderson, chief engineer of the Texas-Mexican Electric Light Company, San Antonio, Tex., is the inventor of the battery.

The plant of the Hastings Electric Light and Power Company, Hastings, Neb., was sold at sheriff's sale on April 4, bringing $15,000.

AFFAIRS IN BROOKLYN.

At the meeting of the Brooklyn Board of Aldermen on April 10, the Railroad Committee reported favorably the application of the Nassau Electric Railroad Company for permission to operate a road on South Eighth street, Marcy avenue, South Fifth street and other thoroughfares to the Evergreens Cemetery, from North Second street and Marcy avenue to New York avenue and Flatbush and along other streets already published.

The application of the Kings County Electric Railroad Company for franchises for Rockaway avenue, Broadway and Cooper avenue to the city line was also reported favorably, as well as the petition of the Brooklyn City Railroad Company for an extension of its tracks, exempting portions of Putnam, Evergreen and other avenues and streets where consents have not yet been obtained. This is the privilege for which the company has offered $150,000.

The Stillwell-Bierce Manufacturing Co., Dayton, Ohio, has closed a contract with the Portland (Oregon) General Electric Light Company, to furnish 22 turbine wheels for the new power station of the latter-named company.

THE MUNSIE CONDUIT RAILWAY SYSTEM.

Mr. W. H. Munsie, of New York City, who has a section of his new system of underground electric street railway in operation at Hartford, Conn., reports that so far no hitch has occurred. The system has worked without any interruption notwithstanding the severe wet weather and lack of drainage in the conduits. The city anthorities would not permit Mr. Munsie to put in drainage pipes, and the conduit was full of water most of the time, but it proved no hindrance to the movement of the car. Those who have examined the system declare it to be the best electric street railway system yet produced. It requires a small, inexpensive conduit resting on the ties, in which, at every sixteen feet, there is a "head." This head rests on springs. When the car strikes these heads they are depressed an inch or more, making contact with the live wire, and after the car has passed the springs force the "head" upward again, breaking the contact. The point of contact is made in a small water and moisture-tight chamber, which has so far given general satisfaction.

PERSONAL.

Dr. Louis Bell, of the General Electric Company, has been on the Pacific coast looking after long-distance electrical transmission matters.

Charles W. Phipps, who has grown up in the factory of the Brush Electric Company, having started in prior to 1880 as a boy, and who has represented the Brush company in construction work in England and on the Continent and China and Japan, and in the eastern portion of this country with headquarters in New York, has recently been appointed superintendent of the Brush Company. Mr. Phipps is noted for his energy and push, his thorough knowledge of Brush apparatus, and his ability as an engineer. He is a man who is very popular with all those who have come in contact with him. At the peril of his own life he rescued a number of sailors in the bay at Yokohama, Japan. His action in climbing the arc light post at the corner of Sixth avenue and 33rd street, New York City, during a storm, and in the presence of several thousand people, and rescuing a lineman of the United States Electric Illuminating Company, was heroic, and gave him a deserved reputation of being a brave man. Anyone with such a record will no doubt succeed anywhere.

Charles N. Black, a graduate of Princeton, and one of Prof. C. F. Brackett's most promising pupils, has been appointed assistant superintendent. Mr. Black, after leaving Princeton, secured a position in the Brush factory, and with hard work, combined with his knowledge and ability, has secured just promotion.

H. B. Odell, formerly superintendent of the Newburgh Electric Light Company, Newburgh, N. Y., has resigned and A. H. Kellogg has been appointed in his place.

WHAT AMPERE MEANS.

The name of a distinguished French physicist and electrician, who, at the beginning of the present century enunciated some of the leading principles and theories in electricity. At the Paris Electrical Congress of 1881, the word was adopted as the name for the unit for measuring quantity of electricity. Thus, a current of eight ampères drawn from an incandescent lighting wire gives one horse-power; sixteen amperes, two horse-power, &c. This unit, the most important in all power measurements, has already become familiar and highly useful in all electric light and power work. For this reason the Crocker-Wheeler Electric Company, who is doing a very large business in the construction of dynamos and motors for all classes of work in which "power" is the needed element, has established its new and enlarged works at a suburb of Newark, N. J., and has named the place Ampère. A railway depot named Ampère has also been opened for it opposite the entrance to the works on the Montclair branch of the D., L. & W. R. R., and as hundreds of the employés are now settling there, the town will soon be one of the busiest industrial centres in New Jersey,—as noted for its electrical machinery as Trenton is for pottery. Ampère is directly connected with the Taylor Building, No. 39 and 41 Cortlandt street, New York (the general offices of the Crocker-Wheeler Electric Co.,) by means of the telegraph and the long distance telephone. It is 11 miles from New York City.

SMALL BUSINESS TO BE IN.

Among the cases brought before the Charleston, S. C., Presbytery at the recent meeting was a complaint against Miss Sadie Means, an employé of the telephone exchange. Miss Mean's duties require her to work one hour on Sunday, and it was this fact that was made the basis of complaint against her. We wonder if the Presbytery has provided a way as satisfactory to Miss Means to enable that lady to earn her living should she yield to the pressure from the church and give up her telephone situation?

NEW YORK NOTES.

Office of The Electrical Age,
First Floor, World Building,
New York, April 15, 1893.

Mr. J. H. Williamson, of the Manufacturers' Advertising Bureau, is serving his country this week doing jury duty.

Mr. T. J. Murphy, of 136 Liberty street, New York, proposes to have on exhibition at the World's Fair some of his best specimens of marbleized slate. One must see this product to appreciate its excellent qualities and appearance.

A very enjoyable birthday party was given Mr. W. H. Baker, Vice-President of the Postal Telegraph Co., on April 13, in which twenty-five of his friends participated.

Mr. Geo. H. Guy, Secretary of the New York Electrical Society, has returned from Europe where he has been sojourning for the past six months.

Mr. F. C. Randall, of the J. G. Brill Co., Philadelphia, gave us a pleasant call last Thursday.

The National Conduit Company, Times Building, city, has contracts for over $400,000 worth of its cement-lined conduit. One order alone—for the Philadelphia Traction Company—calls for 2,300,000 feet of 2½ and 3-inch conduit. The Providence Telephone Company, has given an order for 166,000 feet, and the New England Telephone Company, of Boston, 200,000 feet, and 50,000 feet for the Detroit Telephone Company, and 50,000 for the Buffalo Street Railway Company have been ordered. All of these contracts have been secured since January 1, last, and the company expects that before the fall double this quantity of conduit will be called for. It is noteworthy that the aggregate of these orders almost equals the total amount of conduit that has been laid since underground operations began. It is said that the National Conduit Company has taken every order for conduit so far this year.

Harry P. Barr, formerly manager of the Sperry Electric Company, New York, is now with the General Electric Company, 44 Broad Street.

At the meeting of the Board of Electrical Control, on April 10, Mayor Gilroy introduced a resolution which was adopted requiring that all electric light poles not erected in conformity with the rules of the Board be removed from the streets. The electric companies state that it will cost $75,000 to make the necessary changes. The Board requires that the poles shall have cast iron bases, or sockets, and each costs about $50.

Low tension subways are to be built in 125th street, between 1st and 3d avenues; in 65th street, from 9th to 11th avenues; in seventh avenue from 110th to 138th streets. High tension subways will also be constructed in Pearl street, from John street to Hanover square, in Battery place, from Greenwich street to West street; in Park place, between Greenwich and West streets; in Spruce street, between Nassau and William; in Avenue B, from 7th to 14th streets; in University place, between Waverley place and 14th street, and in 4th avenue from 40th to 42d streets. This construction work was ordered by the Board of Electrical Control at its meeting on April 10. W. T. H.

The Electrical Age's Illustrated Record of Patents.

Issued April 11, 1893.

495,026. Spool for Electric Coils. George W. Demmick, Lynn, Mass., assignor to the General Electric Company of New York. Filed Nov. 23, 1892.

495,030. Means for Telegraphing. William H. Fahrney, Chicago, Ill. Filed Oct. 22, 1892.

495,035. Electric-Railway Trolley. Frank Heath, Minneapolis, Minn., Filed July 11, 1892.

495,038. Multiple Thermal Cut-Out. Warren S. Hill, Boston, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Aug. 10, 1889. Renewed June 2, 1890.

495,047. Electrical Indicator for Rudders. Charles V. Knowles, Somerville, N. J., assignor to Edwin Holmes, New York, N. Y. Filed Feb. 16, 1892.

495,058. Commutator-Connector. Edward D. Priest, Lynn, Mass., assignor to the General Electric Company, of New York. Filed Nov. 16, 1892.

495,077. Electric-Arc Lamp. Addison G. Waterhouse, Hartford, Conn. Filed Nov. 28, 1892.

495,086. Voltmeter and Ampère-Meter. Eugene Gengenbach, Schenectady, N. Y. Filed May 13, 1892.

495,087. Central Office Apparatus and Circuit for Telephone-Exchanges. Edward J. Hall, Morris, N. J., assignor to the American Telephone and Telegraph Company, of New York. Filed Oct. 13, 1892.

495,107. Electrode for Secondary Batteries. George D. Coleman, Chicago, Ill., assignor of nine-twentieths to Craig R. Guerin, same place. Filed June 10, 1892.

495,125. Electro-Magnet. Simon H. Stupakoff, Pittsburg, assignor to the Union Switch and Signal Company, Swissvale, Pa. Filed Sept. 5, 1892.

495,127. Electric-Annunciator System. Edmund R. Wilder, Kansas City, Mo. Filed June 23, 1892.

495,136. Commutator-Brush. Karl Koch, Elsey, near Hohenlimburg, Germany. Filed Nov. 10, 1892.

495,138. Magneto-Electric Machine. Joseph N. McLeod, Brooklyn, assignor to the McLeod Electric Manufacturing Company, New York, N. Y. Filed Apr. 15, 1892.

495,139. Magneto-Electro Generator. Joseph N. McLeod, Brooklyn, assignor to the McLeod Electric Manufacturing Company, New York, N. Y. Filed April 27, 1892.

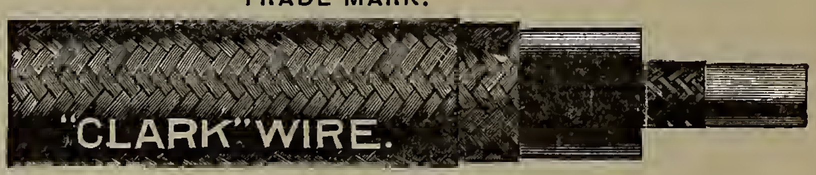
495,148. Electro-Mechanical Steam-Engine Recording-Indicator. Reuben G. Collins, Dollar Bay, Mich. Filed May 2, 1892.

495,176. Electric Battery. Frank M. Archer, New York, N. Y., assignor, by mesne assignments, to the Hero Electric Company, Jersey City, N. J. Filed Nov. 25, 1891.

495,177. Electric Battery. Frank M. Archer, New York, N. Y., assigned by mesne assignments, to the Hero Electric Company, Jersey City, N. J. Filed Nov. 25, 1891.

THE
"CLARK" WIRE.

TRADE MARK.



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Clark Joint Gum should be used for making waterproof joints. This is put up in half-pound boxes, in strips about one foot long and five-eighths inch wide, and when wrapped about a joint and pressed firmly it makes a solid mass. **FOR RAILWAY** and **MOTOR** use we make all sizes of stranded and flexible cables with Clark insulation.

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TRADE MARK.

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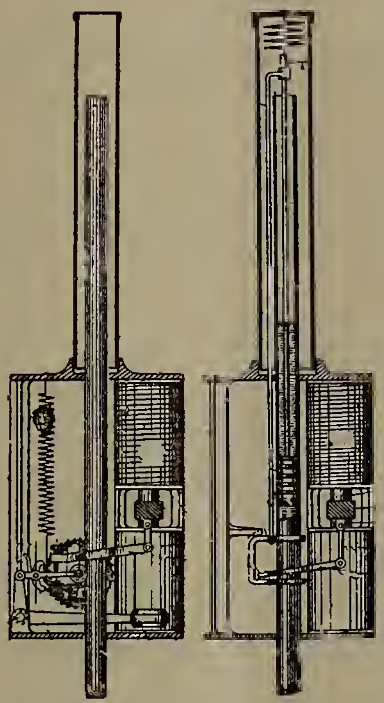
61 to 65 Hampshire Street, Boston, Mass.

HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician.

PATENTS.—Continued.

495,179. System for Protecting Telephone Apparatus from Lightning. John J. Carty, New York, N. Y., assignor to the Metropolitan Telephone and Telegraph Company of New York City. Filed Aug. 5, 1892.

495,212. Process of and Apparatus for Treating Ores. John F. Wiswell, West Medford, Mass., assignor to the Electric Gold and Silver Chlorination Company, Kittery, Me., and Boston, Mass. Filed May 10, 1892.


495,077—ELECTRIC ARC LAMP.

495,225. Potential-Indicator. George A. Lintner, Minneapolis, Minn. Filed Nov. 17, 1892.

495,229. System of Electric Conversion. Edwin W. Rice, Jr., Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed June 18, 1888.

495,240. Incandescent Lamp. George H. Benjamin, New York, N. Y., assignor to Siemens & Halske, Berlin, Germany. Filed Nov. 14, 1892.

495,287. Electric Alarm Clock. Thomas P. Adams, Rico, Colo. Filed May 23, 1892.

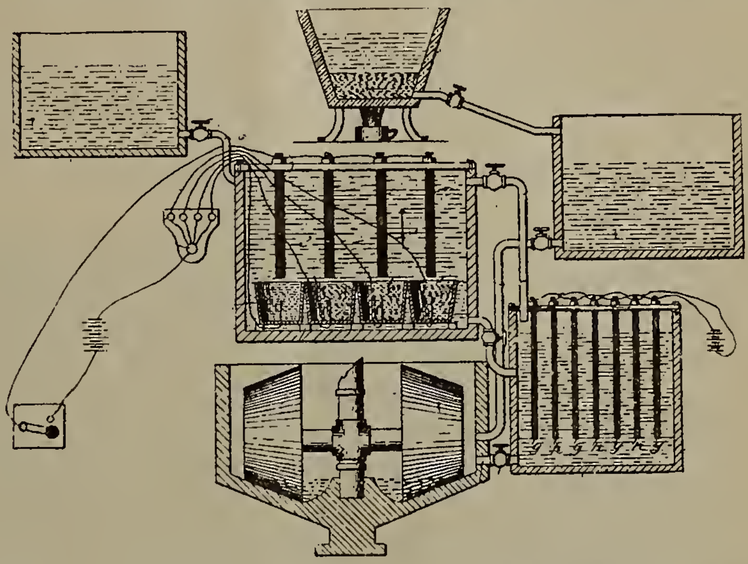
495,306. Galvanic Battery. Clyde J. Coleman, Chicago, Ill. Filed June 6, 1891.

495,374. Cable Tramway Grip. Alfred Rosenholz, Wardner, Idaho. Filed July 21, 1892.

495,393. Apparatus for Electric Welding. Charles L. Coffin, Detroit, Mich. Filed June 11, 1891.

495,394. Machine for Electrically Welding Metals. Charles L. Coffin, Detroit, Mich. Filed Aug. 6, 1892.

495,443. Traveling Contact for Electric Railways. Charles J. Van Depoele, Chicago, Ill.; C. A. Coffin and Albert H. Wahl, administrators of said Van Depoele, deceased, assignors to the Thomson-Houston Electric Company, Boston, Mass. Filed March 12, 1887.


495,212—PROCESS OF AND APPARATUS FOR TREATING ORES.

495,461. Electric Arc Light. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Aug. 23, 1892.

495,463. Electric Arc Lamp Carbon. George M. Lane, Asbury Park, N. J. Filed Sept. 11, 1890.

495,467. Incandescent Lamp. Henry Green, Hartford, Conn., assignor of one-half to Geo. S. Miller, same place. Filed Oct. 16, 1891.

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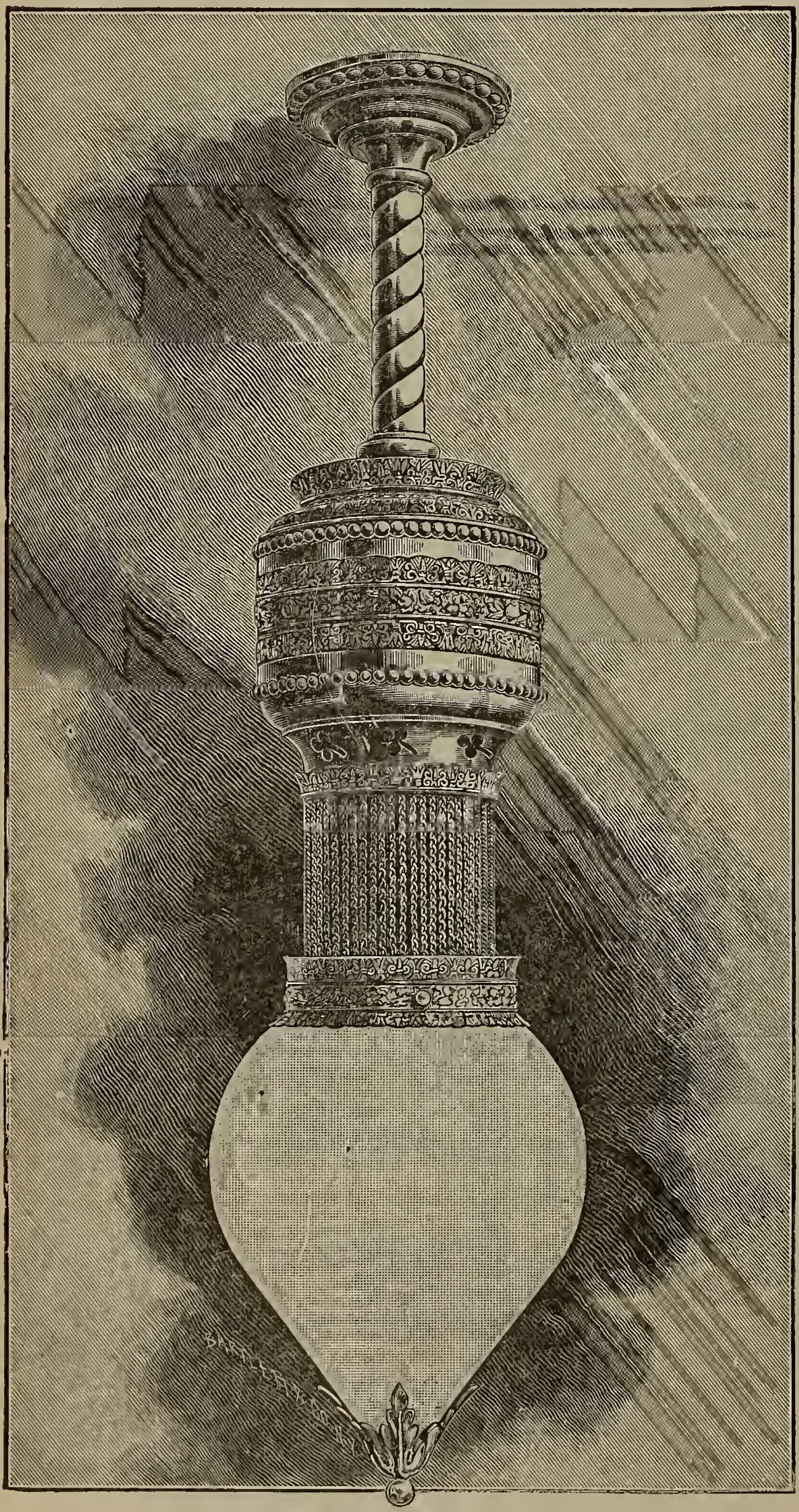

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ESTABLISHED 1881.

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T. R TALTAVALL, Secretary and Editor.

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NEW YORK, APRIL 29, 1893.

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THE LAMP CASE IN ST. LOUIS.

The decision of Judge Hallett in St. Louis, on April 20, in the lamp case caused a sensation in electrical circles, and indications seem to point to the practical undoing of what has hitherto been done tending to establish a monopoly in the manufacture of incandescent lamps. The Columbia Incandescent Lamp Company, of St. Louis, was proceeded against by the Edison Electric Light Company, who asked that the former concern be enjoined from making and selling incandescent lamps. The injunction asked for was denied by Judge Hallett, and the effect of this will probably be that those companies already closed up by the Edison company will endeavor to have the injunctions against them removed so as to enable them to resume the manufacture of lamps. In asking the courts that this be done these companies unquestionably will now have good grounds for their petitions. The decision of Judge Hallett will naturally have considerable influence in future cases of this character, and it is probable that no time will be lost by the concerns involved to take advantage of the situation. The Columbia Company's defence rested entirely upon the Goebel feature of the lamp case, and it was strengthened by the presentation of new evidence in support of Goebel's claims. By reason of having more time in which to prepare these claims than did the Beacon Vacuum Pump and Electrical Company, of Boston, the Columbia Company was able to make a much stronger case and has won its point. We print Judge Hallett's decision in full in this issue; there all the facts in the case are set forth.

ILL-ADVISED LEGISLATION.

There is no doubt that many of the business interests of this country suffer from too much legislation. As an evidence of this fact we call attention to the article of Mr. Allen R. Foote, which appears on another page. Mr. Foote therein throws the light of reason upon the provisions of a bill introduced into the legislature of a neighboring state with the object of regulating electric lighting and gas industries. The injustice of the measure is clearly revealed by Mr. Foote, and how any intelligent legislator could support such unfair legislation is a mystery. Mr. Foote deserves the thanks of those interested for his stand for justice and fair dealing.

IMPORTANT TROLLEY PATENTS GRANTED.

Two patents were issued on April 11, to the Thomson-Houston Electric Company, assignee of Charles J. Van Depoele, which patents contain broad claims to the trailing trolley now universally used on electric railways. This trolley was first used by Mr. Van Depoele, at Toronto, in 1885, and was subsequently employed on a road at the New Orleans Exposition, and on his road at Montgomery, Ala., in 1886 and 1887. The application of the earliest patent was filed March 12, 1887, and has been in involved and protracted litigation in the patent office, which has finally been settled in favor of Van Depoele. The prior patents of Van Depoele cover broadly any sort of an under-running and upward-pressing trolley, but these relate especially to the trolley in which there is a trailing arm swinging around a pivot on the top of the car, with provision for pressing the outer end of the trolley arm against the under-side of the conductor by the action of a spring.

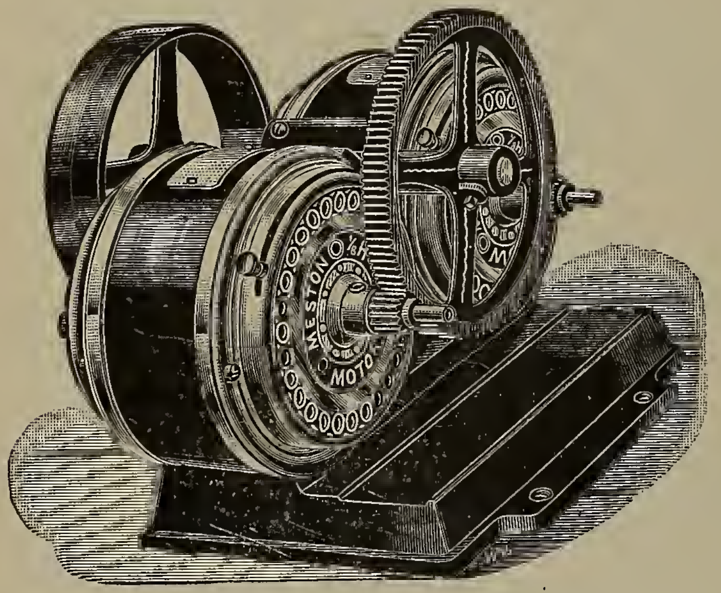
It is said that there is no question but what these patents will secure to the Thomson-Houston Electric Company, and its successor, the General Electric Company, full control of every electric railway trolley now in operation.

MESTON SLOW SPEED ALTERNATING MOTORS.

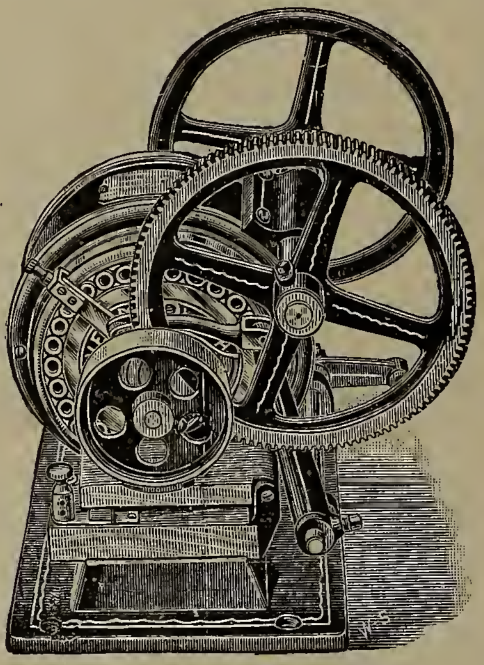
The illustrations given herewith show two adaptations of the ⅛ H. P. Meston alternating current motor made by the Emerson Electric Manufacturing Company. The motors are furnished with a countershaft geared to the motor shaft in the proportion of 1 to 9 which gives a motor speed of from 200 to 280 revolutions per minute. For many purposes this is a much more convenient speed to belt from than the original speed, which is from 2,000 to 2,500 revolutions per minute.

A rawhide pinion is used in the motor shaft, but as the speed of the motor is high it is advisable to place the machine on a solid foundation with a thick pad of paper under the base for the purpose of deadening the vibrations. The countershaft and gearing are carefully designed with the object of reducing the friction loss to a minimum and for this reason it is claimed that the motors will give somewhat more effective power than if they were belted direct.

The duplex motor consists of two motors on one base both geared to a single countershaft, thus doubling the power of a single motor.



DUPLEX MESTON MOTOR.



SINGLE MESTON MOTOR.

The single motor shown in the illustration is furnished with a regulator and brake arranged for connection with a foot treadle, by which the speed can be changed at will, and the motor run in either direction.

Single motors are also fitted with a hand regulator in place of a foot attachment, and the duplex motors are made with a connected regulator which regulates and reverses both motors at once, and applies brake to both. They are also provided with a separate regulator for each motor, in place of a connected regulator.

The Dahl Electric Company, 120 Liberty street, New York city, is the general agent for these motors.

AVAILABLE FORCE.

BY G. EMIL HESSE.

The immense natural forces in the universe are utilized by man only to an infinitely small degree. We point with pride to the fact that there are so many million horse-power in the world, but the big figure does not even seem to suggest a thought that it only represents a mere fraction of almost an infinite power.

Every force on our planet, with only one or two exceptions, has its origin in heat, and most of it is taken from the great storehouse, the sun. We draw on the sun not only for power, but also for light, both night and day. In the day time she pours a flood of light in every direction, and our earth gets her share. In the night the sun rays stored up in our coal either turn a dynamo or burn as gas; this it undoubtedly will do until all the coal on the earth is consumed, and this time may not be very far off. What the result will be of such a calamity is hard to tell, but the rapid increase in the consumption justifies the most serious apprehensions. Many thinking men claim that when the coal is consumed nothing else remains for us to do than to pack our trunks and go to the warmer climates, where no coal is required, and that industry and, as a consequence, civilization will go down. Only the machinery most needed would be moved by the heat of the sun direct and perhaps by the power of such waterfalls that may be in the neighborhood.

Theories to this effect are advanced time after time, and people have actually become resigned to what they consider the inevitable. That the fact is a very serious one, no one can deny, but we have at the present time an efficient and sure method of transmitting great powers at very long distances. A waterfall near Gothenburg, in Sweden, has 200,000 horse-power. The total steam-horse-power of the country does not exceed 100,000 horse-power, therefore that fall alone could supply Sweden with all its power needed, and something for heat besides. This country has 500,000 steam-horse-power, and Niagara alone can supply over 2,000,000 horse-power.

What has to be worked out, and what surely will be, is an efficient system for storing electricity. The present storage battery may be good and well for the present, but a future generation will require something totally different. The history of the present battery is only a repetition of every other original invention. One bright man strikes a new idea, and thousands of other inventors rush in and improve upon it, and they improve upon the system so much that at last nothing more can be done. They have all the time been working in the same groove, and if the foundation was right, then everything is well and good, but if not, then all the time spent is lost, and the only thing left is confusion. There may, in the near future, be discovered a device whereby electricity may be produced direct from coal, which of course would mean a higher efficiency, but this would only put off the time of exhaustion. The only practical way in my opinion is, as stated above, through transmission of the electric current over a wire or by an efficient system of storing.

It would be rather interesting to know how much power the sun produces. If we consider the power of the sun at the distance of our earth, we find, first, that the area is equal to 294,000,000,000,000,000 square kilometers. According to experiments made by the late Captain John Ericsson, we find that it takes six square meters to produce one actual horse-power; we find, therefore, that this will give us 49,100,000,000,000,000,000,000 horse power, which is equal to 10,630,000,000,000,000 tons of coal. The power which the sun sends to our earth is 42,000,000,000,000 horse-power, which is equal to 9,100,000 tons of coal per second the year round. Most of this heat goes to evaporate the water, which is partially used at our water-falls as power. Another part goes to coal in the vegetable world, etc. The heat from the sun, is, of course, greater than what is given above, because the figures are based on what the solar-engine will actually do, and the low efficiency of the engine and loss in transmission from the sun to the earth must therefore be taken in consideration.

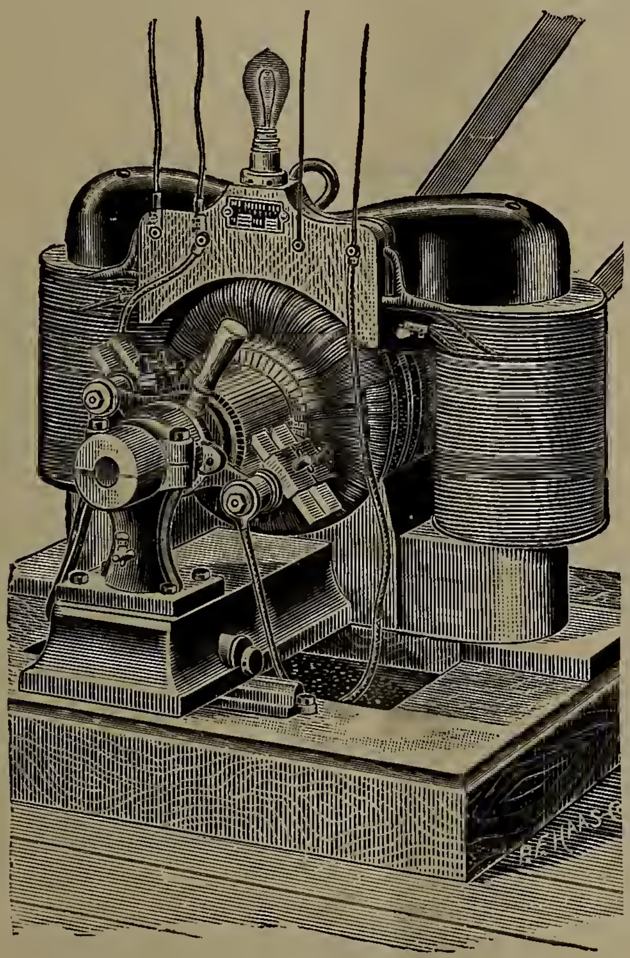


FIG. 2.—AKRON DYNAMO.

Very few attempts have been made to utilize the heat direct from the sun for power, other than those made by Captain Ericsson, who built a one-horse power solar-engine, which worked well. It proved to be a reliable engine in places with a clear sky. There are many such places, especially in California, Arizona, the nitrate fields in Chili, the city of Mexico, and many other places. Coal as a rule is very expensive in those countries, ranging in price between $10 a ton to $20, and in some places it is almost impossible to obtain at any price. There is no limit as to the size of the engine, and as many hundred or thousand horse-power as desired can be obtained without trouble. Plans have been prepared for a ten horse-power solar engine, the estimated cost of which is $1,800 if made on a large scale.

An ordinary ten horse-power engine will cost about $600. The difference in price is $1,200, and the interest of that at six per cent., which, in this case represents the coal bill, is $72. A ten horse-power steam engine will consume about seventy tons of coal a year; the cost of maintenance of the solar-engine is therefore at the rate of $1 a ton for coal, which of course compares very favorably even with the price of coal in the Eastern states.

With such possibilities for the transmission of heat and light from our waterfalls, and the direct production of power from the sun on a large scale, there is very little reason for the apprehension that civilization will move to the equator, or actually die out.

AKRON DYNAMOS AND MOTORS.

The Akron Electric Manufacturing Company, of Akron, Ohio, makes a type of dynamo and motor, for which claims of high merit are made. The accompanying illustration, Fig. 1, shows the style of motor made by this company. A large number have been installed, and the demand for them is constantly increasing. They are made in sizes ranging from ½ to 50 H. P., and those designed for 500 volt circuits are meeting with great success.

Fig. 2 represents the company's latest improved dynamo, which, it will be seen is of a form indicative of efficiency. Its special features as set forth by the company are low speed, high electrical efficiency, excellent mechanical construction, well ventilated armatures, and superior finish and design.

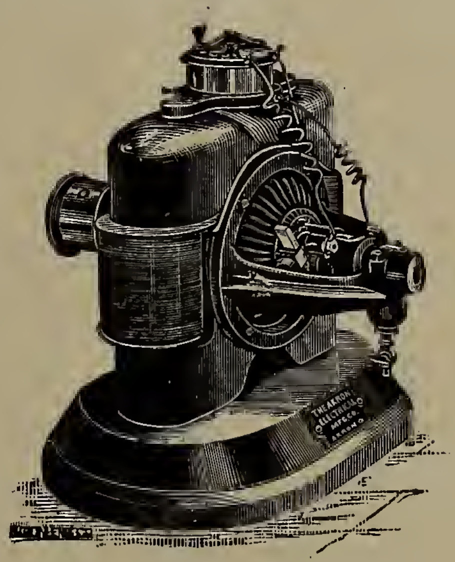


FIG. 1.—AKRON MOTOR.

Dynamos of capacities ranging from 15 to 500 lights are kept in stock, and all machines are compound-wound unless otherwise ordered.

Besides dynamos and motors the company manufactures a full line of single and double pole main switches, fire-proof rheostats, lightning arresters, etc., and carries a general line of electrical supplies, including volt meters, ammeters, etc.

STREET RAILWAY LAW.

The following is a summary of the general law reported to the Connecticut Senate on April 11, which is intended to govern the granting of charters to electric railway companies:

The act provides that whenever any railway company shall have been chartered by the general assembly for the purpose of operating street railways in any city, town or borough, it shall cause a plan to be made showing the highway or highways, street or streets through which it proposes to lay its tracks, to be presented to the mayor and common council of such city, the select men of such town and the warden and burgesses of such borough.

The authorities of the municipalities have exclusive direction and control over the placing, erection, construction and maintenance of any tracks, wires, conductors, fixtures and apparatus, including the relocating and removal of the railway track for the purpose of public improvement.

If any street railway company chartered prior to Jan. 1, 1893, shall not have completed its road before the close of the session of the general assembly of 1895, and any street railway company chartered after Jan. 1, 1893, which shall not have constructed its line before the close of the general assembly succeeding the granting of the charter, all right of the company therein shall cease.

If the railway companies shall discontinue the operation of their lines the local authorities may notify them to operate such railway within thirty days and on failure to comply all rights of the companies may be confiscated.

No street railways shall transport merchandise or baggage except small packages or bundles as carried by passengers, but the railway commissioners may authorize the transportation of merchandise under such regulations as they may prescribe. No street railway shall hereafter be built to parallel any steam road. Persons injured by defect in any part of highway, which the railway is to keep in repair, may bring suit against the town or city, and the railway company.

Town authorities may regulate speed of cars not to exceed fifteen miles an hour. All street railways must report to the State railroad commissioners the same as steam railroads. The companies may borrow on bonds registered by the comptroller not to exceed 75 per cent. of the actual cost of construction. The act is to go into effect on its passage.

Local taxation or tax on the receipts of the companies is not provided for.

CORROSION OF PIPES BY ELECTRIC CURRENTS.

In a recent issue we referred to a curious accident that occurred in Indianapolis, Ind., a short time ago, in which a natural gas pipe, underground, developed a leak under the base of an iron trolley pole and the subsequent ignition of the escaping gas, causing the flame to burn at the top of the pole. In a letter to the *American Gas Light Journal*, Mr. John R. Pearson describes the circumstance in detail, and gives his opinion as to the cause. "Indianapolis, at the section noted," he says "is located on very sandy soil, a few feet of dirt covering forming the surface soil. Illinois street has been improved with asphalt pavement, which necessitates the concreting of the street to the depth of 8 inches before the asphalt is laid on. The concrete and asphalt render the streets impervious to moisture, hence the earth and sand, for the distance of several feet below the street, form a very poor conductor. When the leak of electricity from the iron pole of the street car made its way to the ground, there was no way through the ground for it to return by the ground circuit to the power-house. Owing to the dryness of the earth, as above described, the base of the iron street car pole being in contact with our old, abandoned cast-iron gas pipe, and the fact that the iron gas pipe was corroded, as was also the street car pole, the contact between the two was so poor that necessarily the current in passing from one to the other created an arc, the same as an arc in one of the street lights.

"As the electric arc heat is the most intense heat that it is possible to obtain, hence the current, in making this arc, melted the cast-iron pipe, also the bottom of the street car pole, in its path to find a ground, which it did, following the cast-iron pipe for about 300 feet north. At this point it encountered a wrought-iron natural gas pipe, that crossed the cast-iron pipe, which furnished the ground sought for by the current. The same conditions existed where the abandoned artificial gas pipe crossed the service pipe, extending to the base of the pole. The natural gas pipe was to some extent also corroded, hence the current, in its seeking a ground through the natural gas main, created an arc, melting both the pipes, about the same as had occurred at the base of the street car pole. The natural gas then followed along the old artificial main, until it reached the street car pole which was melted by the arc, passed up through the center of the pole and escaped into the air. The trolley of the first car created a spark, which set fire to the natural gas, the flame from which leaped into the air 15 feet, melting the main current wires in a few minutes, and stopping all cars on the line for several hours. My object in writing you this letter is from the fact that, as all large cities are adopting the electric car systems, I fear that grave results will occur to water and gas mains, unless some better means are adopted than are now used to return the current back to the generator station. In our case it would have been a very serious matter to us if the natural gas had found its way into the cellars or basements of the large blocks adjacent, instead of coming out at the top of the pole, for then there would certainly have been an explosion, with great damage to life and property."

AN EARLY DYNAMO.

BY TOWNSEND WOLCOTT.

At the meeting of the American Institute of Electrical Engineers on March 21 last, after the discussion on Dr. Emery's paper on the cost of steam power, the secretary said:

"Although electrical engineering is considered quite a modern development of general engineering we are constantly having brought to your attention the researches of some of the earlier workers in the field, and one of our most active members has recently come into possession of some facts relating to the history of the machine that is before you, which, as near as we can ascertain was made in the year 1867, by the late Professor Charles A. Seeley. Mrs. Seeley, who is present this evening, has delegated Mr. Wolcott to present some facts in relation to it, after which the machine is to pass into the custody of the Institute and be placed with other historical relics which are gradually accumulating."

Mr. Wolcott addressed the meeting as follows:

Early in the year 1867, when the principle of self-excitation in dynamos was new, and in fact practically unknown except to a few of the most advanced electricians in this country, the subject of electric lighting was broached by Prof. Charles A. Seeley to Mr. Horace Greeley. Mr. Greeley became deeply interested, and highly amused at the idea of "grinding out electricity with a crank, and then making light with it," as he expressed his understanding of Professor Seeley's description of an arc light operated by a dynamo. Mr. Greeley suggested that Professor Seeley should build a dynamo machine and other apparatus, which were accordingly started at once, and on March 28, 1867, Mr. Greeley published an editorial in the *Tribune*, entitled "Electric Light." The scientific points were, of course, furnished by Prof. Seeley, but it is evident that Mr. Greeley understood what he was writing about, as the editorial is interesting reading at the present day, considering the time it was written. I, therefore, quote it in full, as follows:

[From the New York *Daily Tribune* of Thursday March 28, 1867.]

ELECTRIC LIGHTING.

The Nineteenth Century is already conspicuous among the centuries for those great inventions which minister to the wants of mankind. Three-tenths of it still remains; and the leaders of progress in science and the arts are more numerous and active than ever before. It is certainly far from impossible that many who are now living, may witness products of genius yet unthought of, which, for usefulness, may be ranked with the Locomotive, the Telegraph and the Photograph. Indeed, we are not visionary in believing that we are already advancing into the shadow of something which may be as admirable and useful as any of them. Recent advances in science seem to indicate plainly the path which promises to lead to one of the most beneficial developments.

It has been demonstrated that what we call Light, Heat and Electricity, and supposed to be peculiar kinds of matter, are, after all, only forms or modes of motion —that the motions which constitute their peculiarities have no greater difference among themselves than the motions of our ordinary machines. It has been demonstrated that they may be converted into each other—either of them may be converted into ordinary motion—and, conversely, that ordinary motion may be converted into either of them. In other words their production and operation involves simple questions of mechanics. The precise amount of mechanical force required to produce heat and electricity have been exactly and mathematically determined. Thus, the force of the falling of a weight of one pound, a distance of 772 feet will produce heat just sufficient to raise a pound of water one degree Fahrenheit. This exact transformation of falling force into heat may be accomplished with the greatest ease. The converse, however, we have not yet reached in practice. In our attempts by the steam engine to get heat into ordinary useful motion, we practically realize only about five per cent. of what we strive after. It is possible that, before the Nineteenth Century closes, we shall learn how to secure all, or nearly all of that ninety-five per cent. which now escapes us. When we have that knowledge, one pound of fuel which we use for generating power may have its present value multiplied nearly twenty-fold.

The labors of scientific men, within the last five years, have developed methods of transforming ordinary force into electricity. When these methods are put into the most practical form, we shall have electricity so cheap that its applications may be multiplied a hundred-fold.

Practical results have not been so fully obtained in attempts to transfer mechanical force into light. But what we know is sufficient to fill us with the most exalted anticipations. The possibilities are too bright even for dreams. The precise amount of force required to produce a given degree of light has not been determined, mainly for the reason that it *is so small that it eludes our measurement.* It is asserted by savants that the strength of a child would be sufficient to turn night into day for the City of New York, provided that strength were wholly converted into, and should reappear as light. May not this be accomplished in the Nineteenth Century?

But, concerning Electric Light, wonderful things are already accomplished facts. We have transformed force into light through the medium of electricity, and the process has been a success. Such a light promises to come, ere long, into general use.

Through experiments in France and England, and official arrangements for tests in the United States, indicates the importance attached to electricity for illuminating light-houses. The results at Cape La Heve, on the French, and at Dungeness on the British coast, prove that, in clear weather, the electric light is visible seven miles further (27 miles against 20) than the best lights ever before shown at those points; while the advantages are still greater in thick weather, as its density, whiteness and brilliancy, enable it to penetrate fogs that almost totally obscure other lights. The successful experiments of the French Lighthouse Board, corroborated by the British experiments, may well encourage our American Lighthouse Board in the tests about to be instituted in this country, especially as the difficulties which cause the British authorities to hesitate about introducing the electric light generally along their coasts ("lest *their* heavy machinery might break down") are understood to have been overcome by inventions of American genius.

It may be added that the brilliancy of the Electric Light will actually throw shadows from the flames of street lamps on a wall distant about 1,500 feet, and that it surpasses sunlight in photographing—effecting the object in one-third of the time required by Sol himself. Some of the British photographers now use the Electric Light at night for much of their work, especially for copying and enlarging pictures—a profitable part of their business.

The occasionally working of the Atlantic Cables (both being thrown into one circuit of nearly 5,000 miles) by the infinitesimally small battery in a lady's thimble has so utterly revolutionized the notions of electricians and telegraphers concerning the power required for working that vast telegraphic circuit, that intelligent people are now scarcely surprised at the latest assertions concerning the illimitable resources for cheaply generating Electric Light, and the quality of that light compared with solar light.

The electrical display on top of the Massachusetts State House one Fourth of July night, which shed a flood of light that enabled people to read newspapers on Boston Common, was useful in indicating what may be profitably done by apparatus less clumsy and less costly. So also with the "weighty machinery" that produces brilliant results in fog or clear weather off the Dungeness Lighthouse on the British coast. Simplify and cheapen the mode of effecting such results, and what is there to prevent the general use of electricity in producing light? Why should not our streets and our harbors, our factories and workshops, our offices and our homes, be thus brilliantly and cheaply illuminated, now that American scientific skill has devised certain modes of producing electric light which are claimed to be "more economical and more effective than any of the methods hitherto employed?"

We scarcely open a foreign scientific journal without finding allusions to various uses for which electric lights are employed, or about to be employed. One of the latest papers (March 8) says that one of these lights is arranged for service on board the Prince Jerome—Prince Napoleon's yacht—not to illuminate the vessel itself; but, on the contrary, to throw light on other objects, such as a vessel, or a coast, for purpose of attack or defense. For such uses, especially in cases of fog, this light promises to prove very valuable, as ships at full speed, or lying to, or at anchorage, can thus be kept free from danger of collisions, and, in battle, the object to be attacked can be illuminated. "However late in the field of practical adaptation," says *The London Chemical News*, "the electric light, once established on board of a vessel, will become a necessary adjunct to the marine and transport service," and invaluable on board of the fleet passenger steamers. "The illumination of this same light for railways and at the stations, and the approaches thereto, in tunnels, at curves, and otherwise," says a Parisian writer, "has been the order of the day, and the subject of study for some weeks past;" and the experiments on the East Railway of France are said to have been "so successful, that there is reason to expect the best results." Why may not this new light be advantageously used on locomotives?

Multitudinous ways may be found for employing a light so powerful, and so easily and cheaply generated; and profiting by experience of "the way they do these things in France," and in England, our American inventors, who claim to have devised still better methods, can hardly fail to meet prompt and proper attention from people who are annoyed and overtaxed by the effluvia and extortion of the gas companies.

(*To be continued.*)

THE SUPERVISION AND REGULATION OF CORPORATIONS. THE WAY NOT TO DO IT.

BY ALLEN R. FOOTE.

Those who intrust ill-informed or dishonest representatives with power, are more to blame than they for the mischief which they may do with it.

I have before me a copy of "*An Act, providing for the creation of a Board of Inspectors for the supervision and regulation of Corporations in this commonwealth* (*Pennsylvania*) *supplying natural or artificial gas or electricity for light, heat, or power, or all, to the public. Fixing maximum charges for same to consumers, and testing of meters to measure the supply.*" This act is "now before both the Senate and House Committees."

An act of State legislation should show by its provisions that it is enacted solely in the interest of the people. Failing in this, the courts can but declare it unconstitutional. Confining my observations of general principles to this proposition, I will now criticise the act.

Section 1 authorizes and directs the Governor to appoint a "Chief Inspector for the term of four years; his salary shall be four thousand dollars per annum, payable quarterly out of the State treasury." * * "Said inspector shall, upon assuming his duties, appoint six assistant inspectors, at least one of whom shall be a chemist, and at least one of whom shall be an electrician, whose duties shall be as directed by the Chief Inspector. The salary of each of said assistants shall be two thousand dollars per annum, payable quarterly out of the State treasury."

The salaries expressly stipulated amount to $16,000 per annum. The Chief Inspector "shall have charge of the supervision and inspection of Illuminating Gas Companies, Natural Gas Companies, the Fuel and Light Companies, furnishing fuel, or light, or both, to the public in this commonwealth, and the Electric Companies furnishing light, heat, and power to the public in this commonwealth, his powers and duties shall be as hereinafter provided."

There is a doubt growing out of this phraseology as to the companies designated. Companies that mine, transport and sell coal, are companies furnishing fuel to the public (?) and companies operating railroads by steam locomotives, power driven cables and electrical motors, are companies furnishing power to the public (?)

A measure for the public good should be accurate in its definitions.

Section 2 makes it the first duty of the Chief Inspector to compile a list of all the companies that are to be under his supervision, and make an "estimate of the salaries and expenses of this office for one year, including the cost of instruments or equipment necessary to the proper performance of his duties."

This section then makes it the duty of the Auditor General to require a statement from every company listed by the Chief Inspector, showing its gross receipts for the year previous and to *estimate* the gross receipts of such companies as fail to make the required statement within thirty days, "and shall forthwith, from the returns made and estimated, make an assessment against all the companies pro-rata with the business pone by them as aforesaid, the aggregate of which shall equal the amount of the estimate returned by the said Chief Inspector." The Auditor General is further directed to "furnish said assessment to the State Treasurer for collection, to notify each company of the amount assessed against them, to require payment to the State Treasurer within thirty days, and to institute proceedings against delinquents to recover the sum assessed against them with interest at the rate of 12 per centum per annum."

There are many pages in history covered with accounts of the arbitrary use of the power of taxation. Have the people of the Commonwealth wholly forgotten the traditions which cluster around their "Independence Hall" that their representatives presume to create a Chief Inspector, for any purpose, whose uncriticised estimate of the amount required to be spent for the equipment and expenses of his office, shall become an arbitrary charge upon the business of the corporations selected for pillage?

Section 3 makes it the duty of the inspector to ascertain the quality of gas and correctness of meters being used in the State, and fixes a penalty of $50 for setting a meter that has not been inspected. It requires all companies to furnish the Chief Inspector with maps and other technical information, giving a full description of their plants, and fixes a penalty of $500 for non-compliance with his request for the same, within thirty days. It fixes the voltages of electric currents used on house wires for incandescent lamps, but makes no reference to the voltage of currents used for arc lamps. It also authorizes and directs the Chief Inspector to make and enforce "such rules and regulations as in his opinion may be necessary to the fulfilment of contracts with consumers, to secure a regular and efficient supply of electricity, and secure the safety of the public and consumers from personal injury from shock, from fire or otherwise, and generally with regard to any matters in connection with the operation of such corporations." Where is the limit on the power with which this inspector is thus invested? By what method of procedure is he to enforce his arbitrary rules? Is he to be a veritable Knight of Labor who will decree the prices to be paid to and the hours of labor, and prohibit the employment of non-union men? These are "matters in connection with the operation of such corporations" and of vital importance.

Section 4 defines a cubic foot of gas and creates a standard unit for the sale of electric energy and fixes the price per unit for the sale of each commodity.

The price of illuminating gas is fixed at $1.25 per 1,000 cubic feet. Is this intended to surreptitiously reduce the price of gas in the city of Philadelphia, where the plant is owned by the city and consumers are charged $1.50 per 1,000 cubic feet for its use, or, is it intended to serve the interest of consumers who are now wanting gas at $1 per 1,000 cubic feet?

The price for fuel gas is fixed at 22½ cents per 1,000 cubic feet. How will this serve the interest of those who are being supplied with fuel gas by contract without meter measurement?

The act establishes 1,000 watt-hours as a unit of electrical measurement, to be known as the Pennsylvania unit, and fixes the price for the sale of electrical energy at *17 cents per unit.* At this rate 2¼ arc lamps each requiring 45 volts and 10 amperes, will earn 17 cents in one hour, or $7\frac{5}{9}$ cents per lamp per hour When this act becomes a law the cities in Pennsylvania will pay $75\frac{5}{9}$ cents per night of 10 hours per arc lamp, or $275.78 per year. This price is about double the price now being paid for such a lamp. How is the public good served by this enormous increase of price?

In the case of incandescent lamps using Edison's systems, 110 volts and ½ ampere, it will take 20 lamps to earn 17 cents in one hour. In the case of incandescent lamps using the Westinghouse system, 50 volts and ¾ ampere, it will take 26⅔ lamps to earn 17 cents in one hour. Why this discrimination against Westinghouse? Is this another move to crush him?

Section 5 defines the quality of gas that may be sold, and fixes a penalty of $500 for each offence, to be collected from any company supplying gas of a different quality.

Section 6 locates the principal office of the inspector at Harrisburg, and establishes his testing rooms at Philadelphia and Pittsburg. It requires the rules of the inspector to be printed and furnished to each corporation under his supervision. While section 3 makes it the individual duty of the inspector to make and enforce rules, section 6 joins with him for this duty, the Insurance Commissioner of the State and the Chiefs of Departments of Public Safety of the cities of Philadelphia and Pittsburg. If titles confer ability, this will be a most able Board, but which section shall the inspector obey in respect to his rules, No. 3 or No. 6?

Section 7 gives the "rules and regulations made, as recited in section 6, *the same force and effect as if enacted in the act itself*" and fixes a penalty of $500 for each violation of the same. This gives to the rules and regulations devised by persons who have not been elected by the people in their name, all the power of the enactments of the legislature of the State, by which the people are governed. Is this government by the people, through their elected representatives, or by rulers not chosen by the people?

Section 8 provides for the testing of meters in use, and requires the user of the meter to pay the cost of the test if the meter is found to be correct, otherwise, the company owning the meter is to pay the expense and to furnish a new meter.

Section 9 gives corporations, through their authorized representatives, the right to enter the premises of consumers for legitimate purposes connected with their business, and requires sheriffs or constables to render assistance when this right is resisted.

Section 10 gives corporations the right to stop service on account of the non-payment of bills.

Sections 11 and 12 forbid consumers injuring the property of corporations that may be on their premises for the purpose of supplying gas or electricity, and the waste or fraudulent consumption of the gas or electrictricity supplied, and fixes a penalty of $100 for each offence, to be paid to the company.

Section 13 provides that only one of each of the companies under supervision shall operate "in the district described in its charter and shown on its maps filed with the inspector, except in cases where two or more companies are engaged in such business at the time of the passage of this act, and all charters granted shall be exclusive in the district described until the company operating shall declare a twelve per cent. dividend for five consecutive years."

As there is no provision requiring a company to make a dividend, under any conditions, this section will render all franchises now enjoyed by these companies exclusive and perpetual.

Section 14 requires the inspector to report to the Governor.

Section 15, which is the final section of the Act, repeals "any act or part of act inconsistent with the provisions of this act."

This criticism of this act is not intended to be exhaustive, either in its technical, legal, economic or ethical aspect. It is intended only to indicate some of the points of weakness in the act, and generally to show how illy-considered it is, viewed as a measure for the public good.

This measure is framed in the interests of neither the public nor the corporations. It is an open question whether it is promoted by those who want to reduce the price of gas in Philadelphia; by those who want to obtain an increased price for arc lighting, or by those who wish to obtain incandescent lighting at a decreased price. Those who wish to maintain the price of illuminating gas, at more than it should be in the largest city of the State, or to fix the price lower than it should be in some of the smaller towns; by those who have failed to obtain the franchise they desire from the local council of the town in which they wish to operate, or those who, having possession, wish to exclude some rival who by change of method may cut into their business; by those who wish offices created that they may fill them, or those who wish to gain credit with their constituencies by an apparent attack upon monopolies while creating monopolies without their knowledge of their constituents.

There are many ideas in this act which are good in themselves, but which can never be caused to serve well the public good unless they are intelligently formulated in accordance with the requirements of ethical and economic justice. A measure so formed would leave no doubt as to its meaning, and would be so manifestly for the public good that both the people and the corporations would desire its enactment. Until such a measure can be devised and presented for action, the true interests of the commonwealth and the inhabitants thereof will be served by the rejection of this measure and a closer study of the requirements which will serve the public good with greatest certainty.

THE MOST ECONOMICAL AGE OF INCANDESCENT LAMPS.

At the meeting of the American Institute of Electrical Engineers on March 21 last, the following communications were presented in relation to the paper read by Carl Hering,* at the meeting of the Institute on February 21, on the subject named in the title of this article.

The communications referred to are as follows:

Prof. Benjamin F. Thomas:—I am indebted to Mr. Hering for a copy of his very interesting and valuable paper, and for the opportunity to contribute a little to its discussion. All who are interested in any way in incandescent lighting, must, with me, feel under obligation to Mr. Hering for the application of the O'Keenan analysis of the data of the Ohio test, and for his skillful interpretation of the results. The original paper and its discussion at Chicago established the fact that lamps last altogether too long for economical results, and also the fact that the lamp of highest initial efficiency is not always the most economical. Mr. Hering's paper now turns the conclusions there expressed in general terms into a complete demonstration, and adds other facts which will doubtless prove quite surprising to many who have made lamp questions a study. If the results are properly understood and applied, they must prove to be of great value to the lamp manufacturer, the station manager and his customers, and all who have anything to do with incandescent lamps. To the owners of isolated plants, Mr. Hering has demonstrated the importance of renewing lamps when they reach the point of minimum cost. (Why not call it the O. K. point?) It hardly seems right, however, to advise anyone to run the lamps until they "die a natural death" when the amount of light afforded is not important. Economy considered, it is better to use, in such place, lamps of the lowest allowable candle power, and to renew them as elsewhere. Central station managers, who furnish lamps to their patrons, without specific charge for lamp renewals, and who charge by meter record, will, of course, find it pays best to run the lamps just as long as they can, without causing enough dissatisfaction to seriously affect the number of customers they have. A rough calculation shows that even this care may profit by the deductions of Mr. Hering. The manager who runs a lamp 1200 hours, instead of renewing at 400 hours, loses twelve cents of profit which he would have made on the larger current which would have passed through the lamp and meter, if he had renewed at the proper time. The strength of the current which flows through the lamp diminishes as the lamp grows old, and therefore the watt hours which will be recorded will be less during the last half of the natural life of the lamp than during the first half. This is, of course, equivalent to decreasing the station output, when lamps are burned as long as they will last. If we ever have lamps produced and sold at about 15 cents, it will then be best for station managers of the class supposed to renew at the 400 or 500 hour point.

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* See issues of the Electrical Age of March 18 and 25.

It is interesting to note that the man who is a customer to such a central station, will find it profitable to buy his own lamps, even though no deduction be made in the price charged by the station. The higher average candle power of the lamps when renewed each 400 hours will enable him to light his premises equally well with a smaller number of lamps, and the saving in his meter bill will more than pay for all the lamps used, and he will have a more uniform and more satisfactory light. It seems not improbable that the central station of the future will limit itself to supplying current through its mains, the one who buys current furnishing his own lamps, fixtures, wiring, etc., and the fact last considered ought to be helpful in bringing about that state of things.

Mr. Hering's Fig. 3 furnishes a very striking view of the relative values of several lamps as money savers. At 400 hours, lamps A, K, F, and M, are very close together, the extreme difference in cost of 1000 candle hours being only one cent. Where the difference in cost of light is so small, it matters little which lamp be chosen unless the user of the light is particular about uniformity of candle power during the 400 hours.

Referring to Table IV. of the paper read at Chicago,[†] the percentages of original candle power were, at 400 hours, for A, 74 per cent.; for F, 77 per cent.; for K, 78 per cent.; and for M, 90 per cent. The M lamp is therefore best, when uniformity of candle power is deemed important. It must be borne in mind, however, that the number of lamps of each make tested was too small to base a sound judgment of relative merit on, and the above comparison must be considered as an illustration only.

Prof. Elihu Thomson—I have received the advance proofs of Mr. Hering's paper on incandescent lamps. I have very little time at present to add anything to the discussion of the matter. I think his points are well taken, but I also think he is quite right in pointing out that they are theoretical rather than practical. I think his practical rule for the running of lamps, which, as stated, by the paper, is to run them until the diminution of incandescence becomes noticeable and then discard them, is a very good one. Whether to break them or not is another question. They are of course still capable of being run at a high incandescence for a short time if the voltage be increased. In fact, looking at the matter again from a purely theoretical standpoint, it strikes me that the ideal condition for running is to start the lamp at the potential for which it is made and gradually increase the potential so as to keep up a fair or uniform light efficiency regardless of the life of the lamp, letting the lamp go when it will. Of course this is not practical in most systems, but it can be approximated by putting the older lamps on parts of the system which have the highest potential where there exist differences of potential. It also strikes me that the calculations will need to be varied with every change in the time of running of a lamp; in other words if out of a set of lamps there are some which only run a short time for each day while others run a much longer time, the time for discarding a lamp will vary, theoretically, in this case. The short time lamps demand, theoretically, a higher light efficiency throughout their use.

It still remains after the discussion, that we should not relax our efforts to obtain a lamp with long life, and one having an economical efficiency during that life. Furthermore, it is evident that the longer the life of the lamp, if the economy of the light production is maintained, the less in proportion becomes the cost of renewal to the other expenses. There is something to be said also on the score of the convenience of use of the long life in lamps as against a lamp which runs down rapidly, which, in a discussion like this is liable to be left out of the question. Where lamps require to be renewed very frequently and are somewhat inaccessible in their placing, the long life lamps have an advantage in the saving of labor.

In my opinion, the development of the manufacture of incandescent lamps will give rise to the production of lamps of short and long life to suit the varying conditions in practice and the relative cost of power to cost of lamp renewals.

Prof. E. R. Roberts—It was my intention to attend the meeting of February 21; having, however, changed my plans and being very much rushed, I only have time to drop you the following brief memoranda:

1st. An instructive line of investigation, following the method of Mr. Hering's valuable paper, would be to determine the comparative value of lamps "L" 3.8 watts at start, 5.5 at 500 hours and "M" 4.8 at start and 5.1 at 500 hours.

2d. Undoubtedly, blackened lamps should be either destroyed or used where amount of light is of little consequence, or used for resistance racks.

3d. That as long as lamps have a 90% probability of being operated anywhere from 2% below normal voltage, to from 10% and upwards above that, the practical rule, "Smash blackened lamps," should be supplemented by, "pay the interest on $75.00 for a first-class portable voltmeter, use same frequently and systematically all over circuits, and give the medicine called for by the diagnosis," which might be further supplemented by "if, after knowing the disease, you will not pay for the medicine necessary to make a cure, do not complain if patients die young."

OBITUARY.

Manuel A. Vaslier, of Vaslier & Mosquera, electrical supply dealers, of Havana, Cuba, died of consumption March 15; aged about 40 years. Mr. Vaslier was quite well and favorably known to the electrical trade in New York city and elsewhere throughout the county.

Mr. Grosvenor P. Lowrey, the well-known corporation lawyer died at his home on Madison avenue, in New York city, on the night of April 20. His death was due to a stroke of apoplexy. Mr. Lowrey had been in his usual health during the day, and attended to his business affairs up to the usual time of going home.

Mr. Lowrey was best known to electrical people through his connection in a legal capacity with various electrical and kindred enterprises, including the Edison companies and the elevated railways. The great work of his life was the participation in the legal warfare over the Edison patents. He was for several years general counsel of the Western Union Telegraph Company, and the Baltimore and Ohio Telegraph Company.

Mr. Lowrey was born in North Egremont, Mass., on September 25, 1831.

[†] Transactions, vol. ix., p. 271.

DECISION UNFAVORABLE TO THE GENERAL ELECTRIC COMPANY.

On January 17, last, the Edison Electric Light Company was granted an order restraining the Columbia Incandescent Lamp Company, of St. Louis, from manufacturing lamps. On April 13 the case came to trial before Judge Hallett in the United States Circuit Court, St. Louis, on the motion of the Edison Company for a preliminary injunction to prevent the Columbia Company from manufacturing lamps, and on April 21, the Judge rendered his decision, which refuses to grant the injunction asked for.

The following is Judge Hallett's decision in full:

In the Circuit Court of the United States for the Eastern Division of the Eastern Judicial District of Missouri.

Edison Electric Light Company et al. vs. Columbia Incandescent Lamp Company, et al.

Complainants allege infringement of letters patent No. 223,898, issued to Thomas A. Edison, January 27, 1880, for an improved electric lamp. This patent came under the consideration of the Circuit Court of the Southern District of New York in the case of the Edison Electric Light Company against United States Electric Lighting Company (47 Fed. Rep., 454), and was held to be for a lamp "consisting essentially of a filamentary carbon burner, hermetically sealed in a glass vacuum chamber." So understood it is the incandescent lamp in common use, and no question is presented in this record as to the character of respondents' manufacture. The defence to the bill and to the motion for preliminary injunction now under consideration is want of novelty in the Edison patent. Respondents aver that an incandescent lamp, different in form, but in all essential features the same as that now in general use, was made as early as 1854, by Henry Goebel, of New York city, and that it was used by him in various ways and at different times for many years thereafter. It will not be necessary to describe this lamp at length, as it has the same constituents as the Edison lamp. We are at present more concerned with the struggle between the contending forces on the one side to maintain and on the other to disprove the existence and use of the lamp anterior to the date of the Edison invention. A large mass of testimony in the form of affidavits is offered by each party on the question of fact, which to consider at length, would be a tiresome and unprofitable task.

The principal objection urged by complainant against the Goebel invention is that it has an impossible date; no man could make it in the time and manner assigned to it; the incandescent lamp is the product of several auxiliary arts not likely to fall within the compass of a single mind; as an achievement of science the lamp is a matter of progressive steps, some of which must be made by the world at large before others can be taken by any one. This is no more than to say that no man can outrun his competitors to any great length in the field of scientific investigation—a proposition which has no support in reason or experience. There seems to be no reason for saying that Goebel could not reach in 1854 a point attained by Edison in 1879 unless, as was said by the dissenting Justices in the telephone case: "It is regarded as incredible that so great a discovery should have been made by the plain mechanic and not by an eminent scientist and inventor."

In so far, however, as it may be shown that the methods adopted by Goebel were not equal to the results obtained, the evidence should receive the most careful consideration. On this point it appears that Goebel has recently made several lamps of the form used, with the material and tools formerly used by him. These lamps were tested by men of experience and skill in such matters, and they were found to be reasonably effective. They are not so good as the lamps in common use, but they can be operated, and they give reasonable service in time and capacity of light. So that in this way we have *prima facie* proofs of Goebel's ability to make lamps in the way he claims to have made them before the time of Edison's invention.

It is said that Goebel is involved in contradictions and misstatements of fact, due to the lapsing memory of old age or to untruthfulness. Be it so; he does not appear to be an adventurer or an impostor. It is not reasonable to believe that he made the story related in his affidavit, and did not make the lamp he has described. Whatever may be said as to Goebel's veracity, he is supported at many points by witnesses of good repute, who speak with precision and apparently with deliberation. As already suggested, it is not necessary or profitable to go over the testimony at length with a view to determine the relative value and weight of every part. It is enough to say that there is a fair preponderance of testimony in support of the Goebel claim.

There is not the measure of proof demanded by defendant's counsel who maintain that the Court should require proof of the fact beyond reasonable doubt. This degree of certainty is not often attained upon testimony in the form of affidavits, where the issue is contested, and it is not reasonable to demand such certainty as to the defense. Complainants must show a clear right in support of a preliminary writ and a defence which puts the case in doubt is sufficient to defeat the application. It is also contended that the decree of the Circuit Court of New York against the United States Electric Lighting Company, sustaining the patent, which decree had been confirmed in the Court of Appeals of the Second Circuit, is conclusive of complainant's right to the writ for which they now ask. No doubt is entertained as to the conclusive effect of that decree here and elsewhere as to all matters in issue in that cause. For, although respondent was not a party to that litigation, the Court would not, on a preliminary motion, consider any matter which passed to judgment in that suit. The Goebel defense was not made in that suit, and therefore the case has not the authority on this motion which has been ascribed to it. Another suit by the complainants against the Beacon Vacuum Pump and Electrical Company, in the Circuit Court for the District of Massachusetts, is in a different attitude. In that suit the Goebel defence was made, and upon motion for preliminary injunction recently heard and allowed it was overruled. It is contended that the ruling in that case should be recognized and followed as a precedent in respect to the present motion, and perhaps if the issue, the testimony and the situation of the parties appeared to be the same in both cases such result might follow, more from the persuasive effect of the opinion of another court on the same matter than from any notion of authority ascribed for such opinion. In courts of equal jurisdiction proceeding concurrently in the investigation of the same subject, the right and duty of each to exercise independent judgment can not be denied. That they should in the end reach the same result is greatly to be desired, but one can not become an echo to another for that praiseworthy purpose In this instance the consequences to flow from diverse opinions are not regarded as serious. In the Massachusetts Circuit, and here as well, the motion is interlocutory; and in each case the ruling may well enough stand upon the situation of the parties. And we have much additional testimony to that upon which the Court acted in the Beacon case, so that upon all points I do not feel compelled to accept the opinion of the Court in that case.

The ruling of the Court, however, in the Beacon case suggests the propriety of taking security from respondents for observing the decree in case complaints shall ultimately prevail in this suit.

There are other considerations also which should have weight in that direction. It was suggested by complainant's counsel that respondent is a concern of small capital, and that it was made so with intent to avoid responsibility in respect to the infringement now alleged against it. This was not denied, and I suppose we may take it to be true. The retort was in the form of a charge against complainant that it used its monopoly of electric lamps to control the sale of all kinds of electric machinery and apparatus. This charge also passed without denial, and is not difficult to conceive of circumstances in which it would be necessary to ascertain whether it is true. Referring only to the charge against respondent of insufficient capital and assets, the duty of the Court is plain to provide for the contingency of a decision against it. I need not refer to the possible effect of cross-examination in the case of a multitude of witnesses. What now seems plain enough may altogether disappear, and new facts may come to the surface under that crucial test.

The injunction will, therefore, be refused if the respondents will give a bond in the sum of $20,000 conditioned for the payment of such sums (if any) as may be decreed in favor of complainants on the final hearing of this cause. The bond to be filed with the Clerk of the court and to be approved by the Clerk, or by a Judge of the Court, within twenty days from this day.

At 4:30 o'clock Attorney C. E. Fowler furnished the required $20,000 bond, Acting Circuit Clerk Lester Crawford accepting the security.

At the trial, R. N. Dyer of New York made the opening argument on behalf of the Edison company. He was followed by W. C. Witter and William H. Kenyon, of New York, for the defense. They were followed by Clarence F. Seward, of New York, and F. P. Fish of Boston, both for the Edison company, Mr. Fish closing the case. Additional counsel in the case were Judge Henry Hitchcock for the Edison company, and Judge E. B. Adams and Messrs. Fowler and Fowler of St. Louis, for the Columbia company.

The defense was based upon the claimed manufacture and use of the incandescent lamp by Henry Goebel, prior to Edison. Some 250 affidavits were filed in support of this claim. An interesting feature of the case was the fact that the Goebel lamp "No 4," which was looked upon with some suspicion by Judge Colt in the decision of the Beacon case in Boston, was here supported by a formidable array of affidavits. The authenticity of this lamp was further claimed and an effort made to sustain it by the introduction of a new lamp, designated as "No. 9," this lamp, according to the defense, having been made at the same time and in the same manner as "No. 4." This lamp was in the possession of John C. Goebel of New Haven, Conn., a son of Henry Goebel, who makes affidavit that it was given him, with two others, by his mother in June, 1878, just previous to his intended departure for Europe, it being his intention to show the lamps to an uncle in Europe. The date of this event is fixed by a passport, which was filed in evidence, and which was dated June, 1878. Mr. Goebel, however, did not go to Europe as intended. The other two lamps given Mr. Goebel by his mother were given away, one of them to the engineer of the Bigelow Manufacturing Company of New Haven, Conn., who burned it in connection with a dynamo. Mr. Goebel kept lamp "No. 9," showing it frequently to members of his family and others. In October, 1878, he was engineer at the German Hospital in New York, where he showed the lamp to various people. The records show that he left the hospital in 1879. He afterward went to New Haven as an engineer, keeping the lamp in his trunk, and showing it frequently. All three lamps were identified by several people as having been seen in the German Hospital in New York in October, 1878. Further evidence of practically the same character as that introduced in the Beacon case was presented.

The Edison Company offered in evidence 450 pages of affidavits. This was also practically a repetition of the evidence on the Beacon case. Seventeen witnesses saw the telescope exhibited on the streets of New York, and identified the person making the exhibit as Goebel. They did not know Goebel, and saw no lamp used in connection with the exhibit. Some 250 pages of the evidence are from witnesses who saw the telescope, but no lamp. The remainder of the affidavits are from experts who testified as to the condition of the art in 1878, from which they felt convinced that it was then impossible to manufacture or operate such lamps as those claimed to have been made at that time by Goebel.

It is claimed that since the decision of the Beacon case Goebel has taken the same apparatus which he originally used, and has reproduced lamps similar to those submitted in evidence, and has shown them to be operative.

President J. H. Rhotehamel, of the Columbia Company, in an interview said :

"This case has been watched from all over the United States, and its outcome will be hailed with delight by hundreds of manufacturers. Nearly all the makers of incandescent lamps are now closed down by injunctions secured by the Edison people. Ever since this case has been on our place has been shut down also. That is what made it pretty hard on us. The Edison works, however, went on just the same. Among those knocked out by that corporation are the Westinghouse, Sawyer-Man, United States Electric Light Company, Perkin's Electric Lamp Company, Beacon Vacuum Pump and Electrical Company, Steuben Electric Lamp Company, the Chicago, the Sunbeam and a number of others. The Westinghouse people with their millions failed to do what we did to-day. The reason they lost was that they made their defence on patents of their own, wishing to secure a monopoly themselves.

"We went on the broad ground that Edison was not the first inventor, and that we were making lamps from the ideas of a man who antedated him by a good many years. The Edison company was not making its fight so much for the sale of the lamps as it was for the general electrical business it would get should it win. If it had a monopoly on the lamps it would also have it on dynamos, generators and the like. For instance, here a concern was putting up a big building. The Edison people could say 'Give us the contract for putting in your wires, generators and dynamos or we won't sell you any lamps.' They would have the builders absolutely at their mercy. In a short time the manufacture of electric incandescent lamps be open to the world.

Most of the firms making them are under injunction, as I said before. As soon as they can get these enjoining orders removed they will be able to go on."

NEW BOOKS.

William Gilbert, of Colchester, Physician of London, on the Loadstone and Magnetic Bodies and on the Great Magnet the Earth. A translation by P. Fleury Mottelay. New York : John Wiley & Sons. 368 pages, numerous illustrations. Price, $4.00.

This work is a remarkable one in being a translation of the earliest known work published treating on both magnetism and electricity—*De Magnete*, by Gilbert.

De Magnete was published in London in the year 1600 and its appearance marked the beginning of a new era of thought and investigation. The original work was printed in Latin. A copy of the only known portrait of Gilbert is given in the frontispiece of the translation, and the biographical memoir at the beginning of the book tells the story of this remarkable man and his work. *De Magnete* "contains all the fundamental facts of the science * * * that even this day we have little to add to them," observes Dr. Whewell, and Dr.

Thomas Thomson, speaking of it, says: "It is one of the finest examples of inductive philosophy that has ever been presented to the world."

This work is valuable mainly on account of its history, and no doubt those who obtain a copy will derive a great deal of interest in reading its pages. It is bound in white cloth.

Telephone Lines and Their Properties. By William J. Hopkins. New York: Longmans, Green & Co., 258 pages, with numerous illustrations and diagrams. Price $1.50.

On account of the meagreness of telephone literature this book will be welcomed by all electricians and students. Certainly no other work has ever treated the subjects covered by this one as completely, and the information it contains is at once practical and valuable, and the book will be serviceable alike to the student and practical telephonist. To give an idea of the scope of the work we will enumerate its chapters:

Chapter I relates to the design and construction of city lines; II, Underground work; III, Long distance lines; IV, Wires; V, Insulators; VI, Exchanges: VII, Switchboards; VIII, Propagation of Energy; IX, The Telephone Current; X, Measurement; XI, Properties of City Lines; XII, Interference from Outside Sources; XIII, Properties of Metallic Circuits; XIV, Cables It has two appendices, one on oscillation, and the other giving Mr. J. J. Carty's experiments on induction.

Every other branch of the electrical science is well covered by literature but the telephone, and it was a happy thought of the author to turn his attention to this one neglected branch. His book is quite complete and no doubt it will find a large sale for the reason that very few, except telephone electricians, and telephone workers know anything about the practical details of that wonderful instrument and its uses and accessories.

Any of the above named books or any other on electrical and kindred subjects can be obtained at the office of the Electrical Age Publishing Co., World Building, New York City, on receipt of price. Book catalogue by mail free.

THE BANGKOK TRAMWAY COMPANY.

Some six months since the eastern community was informed through the medium of this paper of the intention of the Bangkok Tramway Company to experiment with electricity as a mode of locomotion to replace its present one of traction by ponies. In a country like Siam, where the land is flat and where ponies are exceedingly cheap to both buy and maintain, most companies would have been content to adhere to their pony traction and the very comfortable dividends which have been regularly distributed among the shareholders, notwithstanding sundry disbursements paid to passengers as compensation for slight injuries received.

Arrangements were made, however, to a certain extent through the instrumentality of Mr. E. J. Bagnall of the firm of Bagnall & Hilles, agents for the Brush Electric Company in China and Japan, to supply the plant necessary for working the tramcars at the lower end of the line. Under the very able and energetic superintendence of Mr. W. J. Davison, electrical engineer for the Short Electric Railway Company, boilers, engines and generators have been fixed in a very substantial manner, and the three miles and more of track have been connected by means of electrical conductors in an extraordinarily short space of time, when it is considered that the rough material procurable in Bangkok constituted the only help, means and appliances at his disposal.

Arrangements were made for a preliminary run to test the efficiency of the plant on Monday night. The Central Station at Klong Padung was lit up with a number of incandescent lamps and the engines were put in motion. As word had been spoken of a trial, a motley crowd consisting of all nationalities, had collected to see the result. Excitement became intense when the lamps on the car were lit as if by magic and shortly afterwards the vehicle was seen to move. A preliminary run as far as the Oriental Avenue and back proving successful, a few friends of the Manager of the Tramway Company stepped on board the car. Noticeable among these were Messrs. Maclean, Rovsing, McIver, McBrowne and Scott. A run at the rate of about 15 miles an hour soon brought the car to the end of the line,, where other cars were to be seen under construction. Everything worked most smoothly, as far as the machinery was concerned, and the run was unanimously declared by all to be an unqualified success. An occasion of this kind could not well be ended without the usual christening, and this was done by the invited guests at the Manager's house.

The electric plant supplied by the Short Electric Railway Company, Cleveland, Ohio, arrived on the 16th of November last. The installation covers a distance of a little over three miles. The plant consists of two 80 H. P. single cylinder automatic cut-off engines, built by the McIntosh & Seymour Engine Company, having a 12 1-2" cylinder and a 12" stroke, working at 284 revolutions per minute. The engines are driven by steam conveyed from two horizontal tubular boilers, 16 feet long by 60" in diameter, having a working pressure of 80 lbs. and supplied water feed by a Worthington pump, through a Jones feed-water heater. The furnaces are large and specially adapted for wood fuel. There are two generating dynamos giving 100 amperes at 500 volts. each capable of being worked singly or in parallel. The electric current is indicated and controlled at a switch board by instruments of the latest and most approved systems for governing the pressure and connecting the dynamos, working either singly or in pair with the line. On the switchboard is a very clever device termed a circuit breaker, designed with a view to minimize risk. This ingenious invention guards against the possibility of a superfluous amount of electric current on the line, or on the trolley, by automatically cutting off the circuit and leaving the line free from current. The overhead wire consists of No. 2 hard drawn copper, and is suspended by steel brackets and insulated hangers from poles at the side of the road. The entire length of 17,200 feet is in three pieces only, joined by two sleeve joints. The return current is conveyed through the rails, which have in this instance owing to defective conductivity, been carefully con, nected by galvanized iron wire bonds passing through holes drilled in the extremities of each rail and riveted. These bonds have in turn been soldered on to a supplementary wire running the whole length of the track and are connected with the switchboard at the central station.

The cars, very solidly built of teak, are mounted on an all-iron truck especially adapted for tramway service and carrying a 20 H. P. motor. They are also fitted with five incandescent lamps of 16 candle-power each.

The starting, stopping, reversing and regulation of the speed is controlled by the driver from the platforms, at either end of the car, as is also the lightning arrester and an automatic arrangement devised for severing the connection from the motor in the event of a mishap, and thus precluding or minimizing all risk of accident.

The speed attainable by the new cars is about 20 miles an hour, but about 15 will be the maximum speed on clear runs. The artistic design, combined with solidity of the engines, generators and general plant, together with the "finish" given to every detail of the machinery supplied, point to the fact that the Short Electric Railway Company has spared neither time, trouble nor expense in keeping its name in the East on a par with the very high reputation it has acquired in the electrical engineering world. The reputation of this Company has certainly not suffered any loss at the hands of its efficient and genial representative, Mr. W. J. Davison, who has so successfully carried out its contract in Siam.—*Bangkok Times*, Feb. 25, 1893.

STEAM BOILER ECONOMY.

It is estimated that there are 14,000 heat units in a pound of good bituminous coal. A heat unit is equal to 772 foot pounds, so that if all the heat units in a pound of coal could be converted into work, we should have 14,000×772÷33,000×60=5.45 horse power if exerted in one hour. The ordinary coal consumption is from six to twelve pounds of coal per horse power, while with boilers of the most approved design and the very best high pressure expansion engines, a duty of one-horse power for 3.1 lbs. of coal would be considered a remarkably good showing. Now if all the heat units in 3½ lbs. of coal could be converted into work without loss, we should get instead of one horse power, 19.46 horse power; such a result, or anything approaching it, can never be obtained, but that there is a great room for improvement, no one will deny. There is too wide a range even between 3½ lbs. and 12 lbs. of coal per horse power, and the engineer who will sit down and be satisfied with such extravagant waste as a consumption of twelve pounds of coal per horse power, is dishonest to his employer, and untrue to himself, perhaps not intentionally, but thoughtlessly so.

The first steps in economic boiler practice, is that they should be kept scrupulously clean both inside and out; one-sixteenth of an inch of scale deposited on the inside of a boiler will reduce the conductivity of the sheets probably 15 per cent. Soot is a perfect non-conductor, and one-sixteenth of an inch deposited on the heating surface of the boiler will reduce its conductivity fully 15 per cent. more. Steam at eighty pounds pressure will escape into the atmosphere at a velocity of nearly 1,900 feet per second, so that it is easy to see how a small leak either in the joints of the steam pipes, or in the seams of the boiler, or around the rivets, might carry off a great many heat units, thus making another tax on the coal pile.

"The concern is rich; they can stand it." This statement is heard pretty often, and it is safe to assume that the man who makes it is an unprofitable one to have in the mill. It may be that a belt is being mended, and the speaker has made a mistake, making necessary eight or ten feet of new belt. He makes the statement to ease his conscience, but it does not pay for the piece of new belting.

A side of lace leather gets neglected, or is thrown over a steam pipe when repairs are being made. Next day steam is admitted to the circulation, the lacing is ruined, and the firm "stands it," just because a man is careless. A break-down occurs, caused by neglect of a moment's work on a set screw with a monkey wrench. Again, the "concern can stand it," for "they are rich."

It is evident that the man who makes the statement has no money invested in manufacturing, and it is also evident that he don't realize that the "concern" is growing poorer every day he is kept in their employ. There is no profit in keeping such a man, more than there is in maintaining any other nuisance. When an employé, be he superintendent or day laborer, is heard to pass his mistakes lightly, because the "concern is rich and can stand it," it is high time a change was made. That man never made the concern rich, neither will he help them retain their present standing. He is a weed and must be weeded out.—*Manufacturers' Gazette.*

THE BROOKLYN FRANCHISES.

In a communication to the Brooklyn Board of Aldermen, on April 17, Mayor Boody asked that body to reconsider its action in granting franchises without compensation to the city to the Nassau Electric Railway Company, the Kings County Electric Railway Company, and the Brooklyn City Railway Company. He said these companies were ready to pay large sums of money for the privileges which had been granted for nothing, and suggested that, if unprepared to act at once, the Alderman hold an extra meeting to make provision for a cash compensation that would be just to the city. The communication was placed on file, and a special meeting to consider it was called.

NOTES OF GENERAL INTEREST.

A Pennsylvania paper announces that the application of electricity is in its infancy.

The cyclone which did so much damage in Ypsilanti, Mich., on April 13, prostrated all electric wires, and the city was in complete darkness as a result.

Baltimore was in almost total darkness as far as electric lights were concerned, for four hours, a few nights ago, by reason of the burning of the switch-board at the Brush station.

Fire damaged the works of the Union Electric Company, 45 Broadway, City, on April 19, to the extent of $10,000. The works are located at No. 292 Graham avenue, Brooklyn.

At a recent large meeting of citizens of St. Louis de Mile End, Montreal, resolutions were adopted congratulating Mr. A. J. Corriveau "for the energetic struggle he so valiantly sustained against the Montreal Street Railway Company and for the success he has finally obtained."

The Edison and Westinghouse Electric Light Companies of York, Pa., are indulging in a rate war.

The Perkins Electric Lamp Company, Manchester, N. H., April 11, elected the following officers: President, M. F. Chapman; Vice-President, William B. Whiting; Secretary and Treasurer, A. D. Claflin; Assistant Treasurer, J. J. Gates. The prospects of starting the factory were freely discussed, but a prominent stockholder said that nothing could be given out for publication at this time.

The New York Senate has appropriated $10,000 for electrical experiments on the canals for the propulsion of boats.

The cost to consumers of incandescent lights in Louisville, Ky., has been raised from one-half to three-quarters of a cent per hour per light.

Mellette, Dakota, is considering the proposition of lighting by electricity, the power to be derived from the artesian well.

An exchange, in referring to change of power on a street railroad from horse to electricity, says the line is to be "electrified."

The electric light plant in Winchester, Ill., was destroyed by fire on April 14.

The Columbia Electric Company, St. Paul, Minn., has filed, it is reported, an assignment for the benefit of creditors, to James A. Owens.

The bill allowing cities and villages in Illinois to maintain electric plants and furnish heat, light and power to inhabitants has passed the Illinois senate.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Ashtabula, O.—On April 4, the citizens voted to bond the city for $150,000 for an electric light plant.

Hillsdale, Mich.—The citizens of this place have voted in favor of a municipal electric light plant.

Jewett City, Conn.—This place has no electric light. It is thought that there is a good chance for the introduction of such a plant.

Little Valley, N. Y.—The question of establishing an electric light plant here is being discussed.

North Attleboro, Mass.—An electric light plant is to be established by the city, $50,000 having been voted for the purpose.

Northfield, Vt.—There is a probability of establishing an electric light plant in this place.

Sandusky, Ohio.—An electric plant is to be put in the Ohio Soldiers' and Sailors' Home, in this city.

Woodstock, Vt.—There is talk of establishing an electric light plant here.

Chester, Pa.—The Chester Electric Light Company will enlarge its plant. The building will be extended and additional machinery will be put in.

Millvale, Pa. is discussing the purchase of an electric light plant and water-works.

New York, N. Y.—The Continental Fire Insurance Company has filed plans for a thirteen-story brick, granite, and limestone front office building at 44-48 Cedar street, to cost $350,000.

John C. Barth filed plans for a seven-story apartment house on the southwest corner of Amsterdam avenue and Eighty-first street, to cost $250,000.

Weymouth, Mass.—It has been decided to establish an electric light system for street purposes in this place—arc and incandescent.

Fitchburg, Mass.—The Fitchburg and Leominster Street Railway Company has petitioned the town of Lunenberg for the right to extend its lines and operate the same in this town.

Fort Johnson, N. Y.—The citizens of this place are anxious to have the electric road of Amsterdam extended to connect with this point.

Gettysburg, Pa.—The stockholders of the Hanover and McSherrystown Street railway have voted to put the road under contract at once. Electric lights and a telephone service are also contemplated.

NEW CORPORATIONS.

Buchanan, Mich.—The Buchanan Power and Electric Co. has been incorporated.

Columbus, Ohio.—The Canton-Salem Electric Co., Canton, Ohio, has been incorporated with a capital of $30,000.

The Atwater General Electric Co., of Cleveland, Ohio, has been incorporated with a capital stock of $14,000.

Chicago, Ill.—The Electrical Fireworks and Construction Company, of Chicago, has been organized. Incorporators: Emil Giroux, Alfred Guillaume and Elmer E. Barrett.

The Abatis Electric Manufacturing Co., at Chicago; capital stock, $50,000; for the manufacture of electrical appliances. Incorporators: A. R. Hussey, Nelson Erickson and William Newman.

East Haddam, Conn.—The East Haddam Electric Light Company has petitioned for incorporation.

Hartford, Conn.—Petition has been made for the incorporation of the Colchester Electric Light Company.

Mount Vernon, Ill.—The Mount Vernon Electric Light Company, Mount Vernon, Ill.; capital stock, $20,000. Incorporators: Allen C. Tanner, George W. Evans and Wayland L. Arnold.

Nazareth, Pa.—An electric light company has been organized here with a capital of $10,000.

Riverhead, L. I., N. Y.—The Northport Electric Light Company, with a capital of $25,000, has been incorporated. The following is the list of directors: Oscar Darling, John W. Fowler, John W. Olmstead, Henry Marcus, Charles B. Sanford, F. B. Olmstead, Charles T. Sammis.

Boston, Mass.—The Street Railway Committee reported a bill to incorporate the Rockport Electric Street Railway Company. The same committee reported a similar bill to incorporate the Fall River and Taunton Street Railway Company.

A bill has been reported for the incorporation of the Malden, Melrose and Stoneham Street Railway Company. Capital $85,000. George L. Butterfield and others are the incorporators.

Buffalo, N. Y.—The Beecher Single Rail Company of Buffalo, to manufacture all kinds of electric motive power, locomotives, railroad and street cars, gas and compressed air motors. Capital $400,000. Directors, Charles A. Seaver and Lina Beecher of Batavia, Gue C. Hardesty, and Alfred J. Hibbard, of Buffalo, and George W. Sikes, of Lakeview.

Chicago, Ill.—The South Waukegan Electric Railway Company, Shields Township; capital stock $100,000. Incorporated, Franklin W. Gaase, Calvin Dickey and Bryan Y. Craig.

Harrisburg, Pa.—The Delaware and Schuylkill Railway Company, of Philadelphia, with a capital of $50,000 has been chartered.

The Allegheny Valley Street Railway Company, the line of which will run from Parnassus to New Kingston.

Cross Fork Railroad Company, the line to run from Shingle Bolt Summit to Cross Fork, in Potter county; capital $130,000. W. J. Lewis, of Coudersport, is President.

Rhinebeck, N. Y.—The Rhinebeck and Rhinecliff Street Surface Railway Company, to operate a street railroad from the Central Hudson station at Rhinecliff to East Market and South streets, Rhinebeck. Capital $30,000. Directors, A. H. Hoffman, G. Esselstyn, E. M. Harris, W. A. Tripp, Rhinebeck; J. L. Williams, T. J. Swift, R. H. Hunter, E. A. Wilbur, Poughkeepsie, and R. M. Hoffman, Red Hook.

Toledo, Ohio—The Put-in Bay and Southwestern Electric Railroad Company was incorporated April 15 for $3,000,000. The incorporators are George B. Kerper, J. K. Tillotson, J. B. Foraker, August Fabel and C. A. Gordon, all of Cincinnati, with the exception of Mr. Tillotson.

Hartford, Conn.—The legislature has been petitioned for the incorporation of the Guilford Electric Light Company.

New Milford, Conn.—The New Milford Electric Light Company has petitioned the legislature for incorporation.

BUFFALO NOTE.

The Buffalo Street Railway Company is making very extensive improvements at its power house on Niagara street. It is just installing four Babcock & Wilcox's 1,000 horse power tubular boilers and has two large engines and multipolar generators. It has also just completed a tunnel which runs under its entire battery of boilers, which has an iron car for the purpose of carrying out the ashes. It is placing automatic stokers in the entire plant and will soon build a coal storage house. This will be connected to the boiler plant by a track, the cars dumping the coal directly into the stokers. The company also contemplates building its own trucks for its electric cars after an improved design originated by its superintendent, Mr. Dunning. In the near future another large power plant is to be erected by this company on the east side of the city, to take care of its east side lines.

J. B. McC.

STORAGE BATTERIES ON SECOND AVENUE.

The Waddell-Entz system of storage battery electric cars was tried on the Second Avenue Railroad, New York, April 21. The start was made from the stables at the corner of East One Hundred and Twenty-seventh street and Second Avenue, at 4 P. M. Two cars were required to accommodate the guests, the forward one furnishing the motor power.

The run down to Ninety-seventh street was made in about half the time required by horse cars. The cars run smoothly, and there was an entire absence of jolting.

The officers of the road were much pleased with the experiment. The motors, it is said, will be used on all cars of the line within a few months.

The inventors claim that the new system can propel a car at the rate of thirty miles an hour, but for ordinary use the cars are charged to run at a maximum speed of fifteen miles an hour. One feature of the system is the ease with which the cars can be stopped. No brake is used. The motor is reversed when it is desired to slacken speed. A car running at the rate of ten miles an hour can be stopped within the space of a very few feet, and will run as well backward as forward.

There are two sets of batteries used on each car.

The electric plant, which has just been completed, is the first of its kind, in many respects, ever constructed. It consists of two 100 horse-power safety boilers, two automatic engines of 75 horse-power and two 75 horse-power dynamos.

BUSINESS CHANGES.

The firm of Vaslier & Mosquera, electrical supply house, Havana, Cuba, will be hereafter continued by Mr. J. E. Mosquera. The change was occasioned by the death of Mr. M. A. Vaslier.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, April 22, 1893.

Chas. D. Shain, 136 Liberty street, has secured the selling agency for this vicinity of the Cutter Electrical Manufacturing Company, of Philadelphia. The latter concern could not have made a wiser selection for a representative here, and the wisdom of this step will be proved by the increased orders it will receive from Mr. Shain for push-button switches, and all the other electrical specialties for which the company is celebrated.

The bill which continues the life of the present Board of Electrical Control from Nov. 1, 1893, and which is before Gov. Flower for his approval, contains something new. Unlike the bills of the past two years, which simply added a year to the Board's existence, thus giving the three Commissioners, Theodore Moss, Jacob Hess, and Walton Storm, a year more of office and of salary, the present measure contains the following clause: The term of office of the present incumbents shall expire on Nov. 1, 1893, and the Mayor of the city of New York shall appoint their successors for the term of one year at a salary of $5,000 per annum, payable as the salaries of the present commissioners are paid. The successors of the present incumbents shall be subject to removal at the pleasure of the Mayor. Under the present law the appointing power is in the Governor. Should the new act receive Governor Flower's approval, Mayor Gilroy can appoint three new Commissioners, who may thoroughly reorganize the Board's working force. This consists of an engineer at a salary of $4,800, an electrical expert at $2,500, an assistant secretary, clerk, stenographer, and several inspectors at smaller salaries.

Supt. Frank C. Mason, of the Police Telegraph Bureau, Brooklyn, has received an appointment as First Honorary Assistant of the Department of Electricity of the Chicago Exposition. Associated with Mr. Mason will be Supt. Elliott Smith, of the New York Fire Telegraph Department, and City Electrician Morris W. Mead, of Pittsburgh, Pa.

The Electrical Conduit Traction Equipment Company (Griffin system) was incorporated on March 16 under the laws of New Jersey, with capital of $200,000. The officers are John D. Griffin, president; A. K. Kearny, secretary; William C. Burling, treasurer. The office of the company is at 800 Broad street, Newark, N. J., and the New York branch office is at 94 Wall street. At the latter place the company has a model of its system which has been examined by a number of street railway men, and it is said all were favorably impressed with it.

W. T. H.

FINANCIAL NOTES.

The Hartford Electric Light Company, Hartford, Conn., has been authorized to increase its stock to $500,000.

The Edison Electric Illuminating Company of New York has filed a certificate showing that it had increased its capital stock from $6,500,000 to $10,000,000. It is stated that the amount of capital paid in is $6,500,000, and that the whole amount of the debts and liabilities of the corporation is $3,500,000.

It is reported that the Detroit Electrical Works, Detroit, Mich., is financially embarrassed. Fierce competition in the electrical business is said to have been the cause of the trouble, and it is further stated that $500,000 of Boston capital was invested in the enterprise. The company was organized in 1874. Capital stock, $750,000; capital stock paid in, $664,450; personal estate, $592,079; debts of the corporation, $305,455; credits, $413,568. A mortgage was executed on the property in favor of Hugh McMillan, president of the company, for $185,500 to secure him for the payment of notes held by him against the company, amounting to $98,000, and $87,500 worth of notes given to other persons, and endorsed by him. It is stated that the business will be carried on with the available funds, which is interpreted as meaning that the company will pass into the hands of a receiver, and a reorganization ensue.

COURTESIES OF THE RAILWAY EQUIPMENT COMPANY AT THE WORLD'S FAIR.

We have received a letter from Mr. W. R. Mason, general manager of the Railway Equipment Company, Chicago, of which the following is a copy:

"Gentlemen:—Assuming that it is your intention to visit the World's Columbian Exposition, and realizing that you will be pleased while here to meet others interested in the operation of street railways, we have thought it might be a convenience for us to open a directory of visitors to the Fair.

As it will probably be also a convenience for you to meet your friends at a central and accessible point, we would be pleased to have you send to us the names of those of your company who expect to be in Chicago at that time, giving also the date of arrival, and, if possible, the hotel or apartments where you may be found. As soon after arrival as convenient, we would suggest that you call and register at our office, which is in perhaps the most convenient and prominent location in the city.

Our office is directly opposite the new Art Gallery, where the World's Fair Congress will be held, and is almost directly opposite the main depot for World's Fair trains. We shall certainly take pleasure in extending every courtesy to our friends during the six months, and we trust you will make our office your headquarters and, if desired, have your mail addressed in our care. In the meantime, we shall be pleased to furnish any information needed, as well as to attend to any matters connected with your visit to the Fair.

Trusting to hear from you, and that we may have the pleasure of welcoming you to our office, we are,

Cordially yours,
Railway Equipment Company,
W. R. Mason,
General Manager.

TRADE NOTES.

The Eureka Tempered Copper Company, of North-East, Pa., will have an exhibit of its well-known tempered copper goods in Section U, second floor, Electrical Building, World's Fair, Chicago.

The Atlantic Improvement Co., of Long Island city, Long Island, N. Y., has placed the contract for its new power station, consisting of an engine and boiler house and dynamo room, with the Berlin Iron Bridge Co., of East Berlin, Conn.

Mr. Herbert T. Cate, mason, builder and contractor, 9 Custom House street, Providence, R. I., is said to be the most enterprising builder of fine mason work in that city. His reputation stands high among electrical people in Providence, and among such concerns for whom Mr. Cate has done work may be mentioned the Narragansett Electric Lighting Company, and the Pawtucket Electric Lighting Co. He was also a contractor on the building on Weybosset street, in which is located the headquarters of the Drake, Payson and Whittier Electric Company.

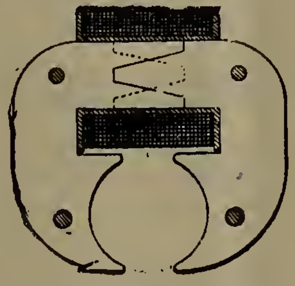
The Electrical Age's Illustrated Record of Patents.

Issued April 18, 1893.

495,538. Dynamo-Electric Machine. Thomas L. Wilson, Brooklyn, N. Y. Filed March 8, 1890.

495,547. Combined Electric Motor and Driven Machine. Rodolphus Fuller, Detroit, Mich. Filed Mar. 31, 1892.

495,561. Commutator for Dynamo-Electric Machines or Motors. Buchanan S. Paterson, Gateshead, England, assignor to Clarke, Chapman & Co., same place. Filed Aug. 16, 1892. Patented in England April 14, 1892, and in France Aug. 13, 1892.



495,562—field-magnet.

495,562. Field-Magnet. Frank A. Perret, Springfield, Mass., assignor to Elektron Manufacturing Company, of New York. Filed Oct. 28, 1892.

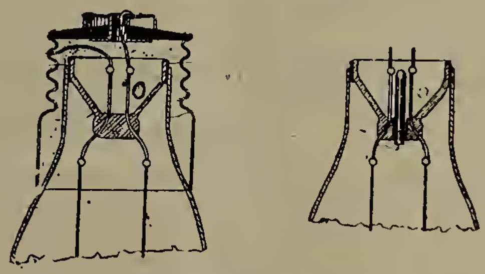
495,582. Ground Generator of Electricity. Michael Emme, Oakland, Cal. Filed Aug. 29, 1892.

495,600. Electrolytic Apparatus. Gustaf O. Rennerfelt, Stockholm, Sweden. Filed Sept. 30, 1890. Patented in Sweden Jan. 8, 1889.

495,601. Electric-Arc Lamp. Frederick T. Schmit, Bradford, England. Filed Aug. 24, 1892. Patented in England Dec. 2, 1891.

495,608. Magnetic Ore-Separator. George G. Crosby, New York, N. Y., assignor by direct and mesne assignments, to the Magnetic Ore Milling Company, of West Virginia. Filed Jan. 27, 1892.

495,615. Cross-Over Switch for Electric Railways. Frank B. Rae, Detroit, Mich., assignor to the Detroit Electrical Works, same place. Filed April 11, 1891.



495,620—incandescent electric lamp.

495,620. Incandescent Electric Lamp. Eugene W. Applegate, Chicago, Ill., assignor to the Applegate Electric Light and Power Company, same place. Filed Jan. 8, 1893.

495,626. Electric Welder for Wire-Fence Machine. John D. Curtis, Worcester, Mass. Filed Nov. 2, 1892.

495,637. Process of Extracting Zinc by Electrolysis. Johannes Pfleger, Frankfort-on-the-Main, Germany. Filed Aug. 24, 1892.

PATENTS.—Continued.

495,638. Secondary Battery. Leslie B. Rowley, Ashland, Wis Filed Sept. 23, 1892.

495,643. Electric Arc Lamp. William A. Turbayne, Detroit, Mich., assignor by mesne assignments to the Turbayne-Tamblyn Company, same place.

495,649. Electric Arc Lamp. Charles F. Adams, Morrison, Ill., assignor of two-thirds to Harvey S. Green and Edward A. Smith, same place. Filed Dec. 19, 1892.

495,674. Rail-Circuit-Closing Contact. Friedrich von Hefner-Alteneck, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Jan 18, 1893. Patented in Germany, July 23, 1885; in Belgium, Aug. 10, 1885; in France, Aug. 11, 1885; in Russia, Aug. 16, 1885; in Austria-Hungary, Sept. 4, 1885; in Italy, March 24, 1886, and in England May 10, 1886.

495,676. Electric Lamp. Tobias Hudson, Baltimore, Md., assignor of one-half to John F. Weyler and Robert S. Weisenfeld, same place. Filed Oct. 7, 1892.

495,692. Trolley-Wire Finder. Charles G. Cleminshaw and William H. Bradt, Troy, N. Y. Filed June 22, 1892.

495,695. Electric-Railway Trolley. William Duncan. Allegheny, Pa. Filed July 20, 1891.

495,714. Lightning Arrester. Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Aug. 5, 1889.

495,738. Electric Rotary Drilling-Machine. Robert M. Jones, Salt Lake City, Utah. Filed June 30, 1892.

495,772. Electric-Arc Lamp. Ernest E. Beauvalet and Léon C. Beauvalet, Paris, France. Filed July 11, 1892.

495,782. Electric Shoe-Sole. Rufus F. Carnes, Winfield, Ala. Filed Dec. 22, 1892.

495,853. Lightning-Arrester. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Feb. 15, 1892.

495,932. Electric-Lighting System. Henry Edmunds, Jr., London, England, assignor of nine-tenths to Albert Sechrist, Denver, Colo. Filed Oct. 19, 1892. Patented in England Mar. 29, 1884.

495,940. Electric Trolley. Jeannot W. Kenevel, Chicago, Ill. Filed Mar. 26, 1892.

495,941. Electric Motor or Generator. William Koedding, St. Louis, Mo., assignor of one-half to Edmond Verstraete, same place. Filed Sept. 21, 1891.

495,951. Incandescent Electric-Lamp Holder. Leroy C. Whitney, Jr., Milwaukee, Wis. Filed Dec. 10, 1892.

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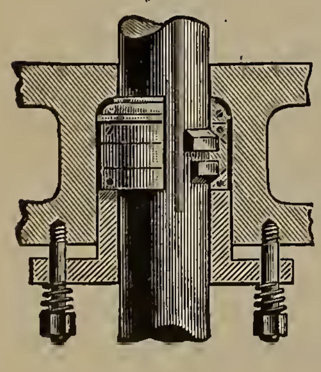

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NEW YORK, MAY 6, 1893.

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CHICAGO.

For the next six months Chicago will be the greatest attraction on earth, and during that time pilgrimages will be made from almost every country on the face of the globe to the greatest of all industrial exhibitions which is now being held in that great city. For the first time in the history of such expositions a building has been provided exclusively for the exhibition of electrical apparatus, and when we recall the fact that at the Centennial Exposition, in Philadelphia, in 1876, the telegraph was practically the sole possessor of the electrical field; that the telephone had just been born and the electric light was but a dream, the marvelous development in electricity since then, as exemplified now at Chicago, may be appreciated. And people say that "electricity is yet in its infancy." If this be true, what it will be when it attains full grown manhood would be hazardous to predict.

Electricity building will no doubt be the great attraction for the hundreds of thousands of visitors during the fair, because in the public mind electricity is enshrouded in an undefinable mystery, and anything mysterious is sure to draw attention. To electrical people it will be a place of deep interest, and an excellent opportunity will be afforded to see and study electricity in every phase of its application. In this issue we give a few facts concerning the building and the exhibits, which will be appropriate matter at this time, and from time to time during the term of the exhibition we hope to give detailed references to the various displays. Besides this matter we devote the greater part of our space this week to the description of various Chicago electrical industries. Most of these concerns will keep "open house" during the fair, and visiting brethren from any part of the world will be welcome. The electrical houses of Chicago are noted for their hospitality, and for this reason it occasions no surprise when we receive invitations from one or another of them to make their headquarters ours, and offers to do all in their power to make our stay in Chicago a pleasant one. These invitations have been issued to the trade for some weeks past, and those who accept the proffered hospitality will find the electrical fraternity of Chicago in possession of big hearts, and very sociable on occasion notwithstanding the reputation they have of devoting their lives to money making. Chicago will be a very pleasant place to be in this summer.

THE MISSOURI ANTI-TRUST LAW.

A despatch from St. Louis states that proceedings were begun on April 21, against 100 leading corporations to declare their charters invalid on the ground of violation of the Missouri anti-trust law. A prominent electrical concern is said to be involved. The total capital of the companies affected is about $5,000,000.

LAUNCHES FOR CHINA.

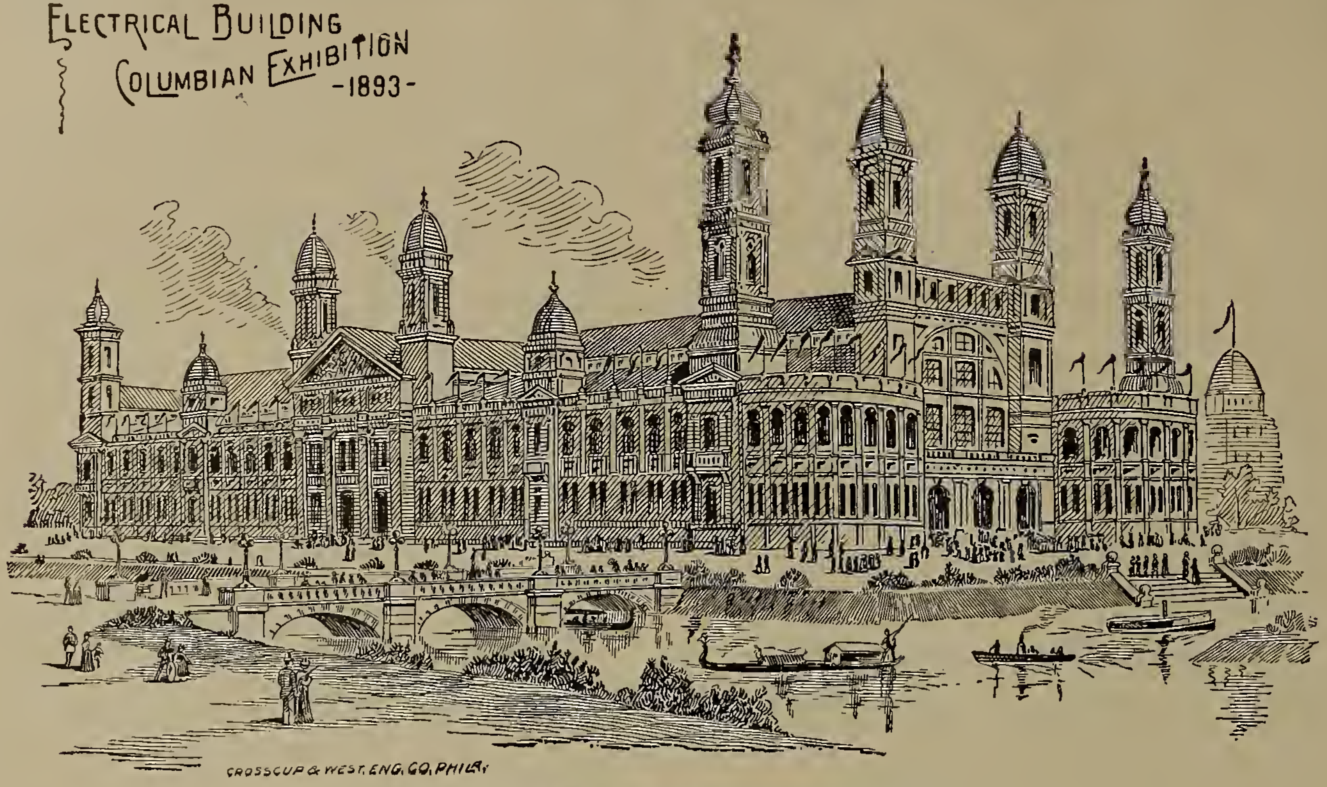
An interesting communication appears on another page of this issue concerning the opportunity to introduce electric or steam launches in China. Here is a possibility of building up a lucrative trade.

NATIONAL ELECTRIC LIGHT ASSOCIATION.

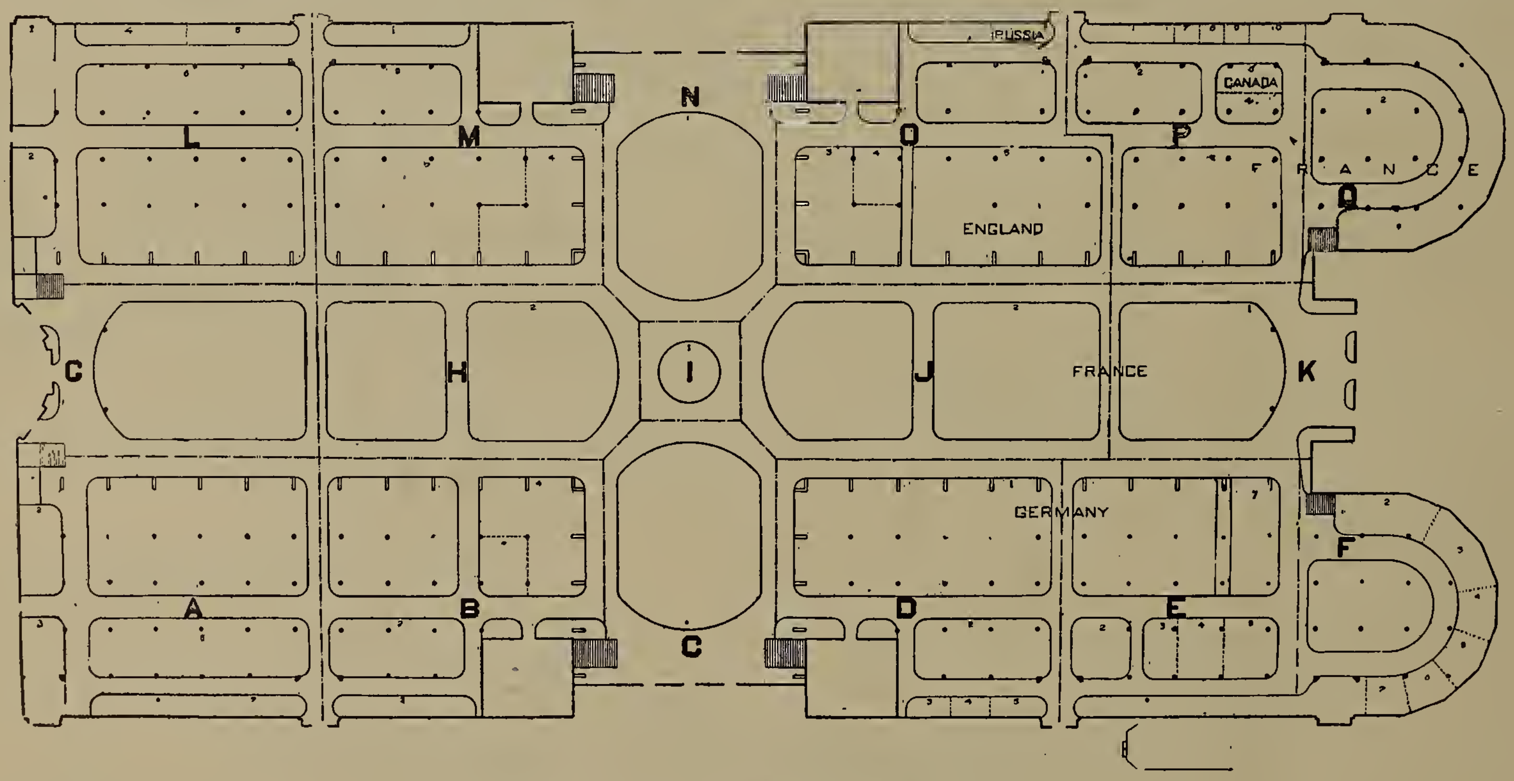
At a meeting of the Executive Committee of this Association, held in the office of the Secretary in New York City, on April 28, it was decided that the association would hold no convention during the coming summer.

ELECTRICAL BUILDING, COLUMBIAN EXHIBITION.

As the time for the opening of the World's Fair is at hand, more and more interest and enthusiasm is manifested in this extensive and beneficial project. As the age in which we live might truly be called the electrical age, the people at large as well as the electrical fraternity expect to see an electrical exhibit at the Fair, which will far surpass anything of the kind before attempted. It was in accordance with this idea that the Electrical Building was constructed. This handsome building and its contents will act as a magnet toward all visitors interested in the electrical science, either in a professional or an amateur way, by drawing them within its spacious halls, to view the triumphs of man's ingenuity. The building is located near the centre of the grounds. The south front is on the great quadrangle or court ; the north front faces the lagoon ; to the east is the Manufactures Building, and to the west the Mines Building. The architects are Van Brunt & Howe, of Kansas City. The cost of the structure is $375,000. The general plan of the building is based upon a longitudinal nave, 115 feet wide and 114 feet high, crossed in the middle by a transept of the same width and height. With the exception of the nave and transept, which have a pitched roof, the roof is flat. It is provided with skylights and 62 feet in height. The exterior walls are of the continuous order of pilasters, supporting a full entablature, and resting upon a stylobate 8 feet 6 inches.



EXTERIOR VIEW OF ELECTRICAL BUILDING.

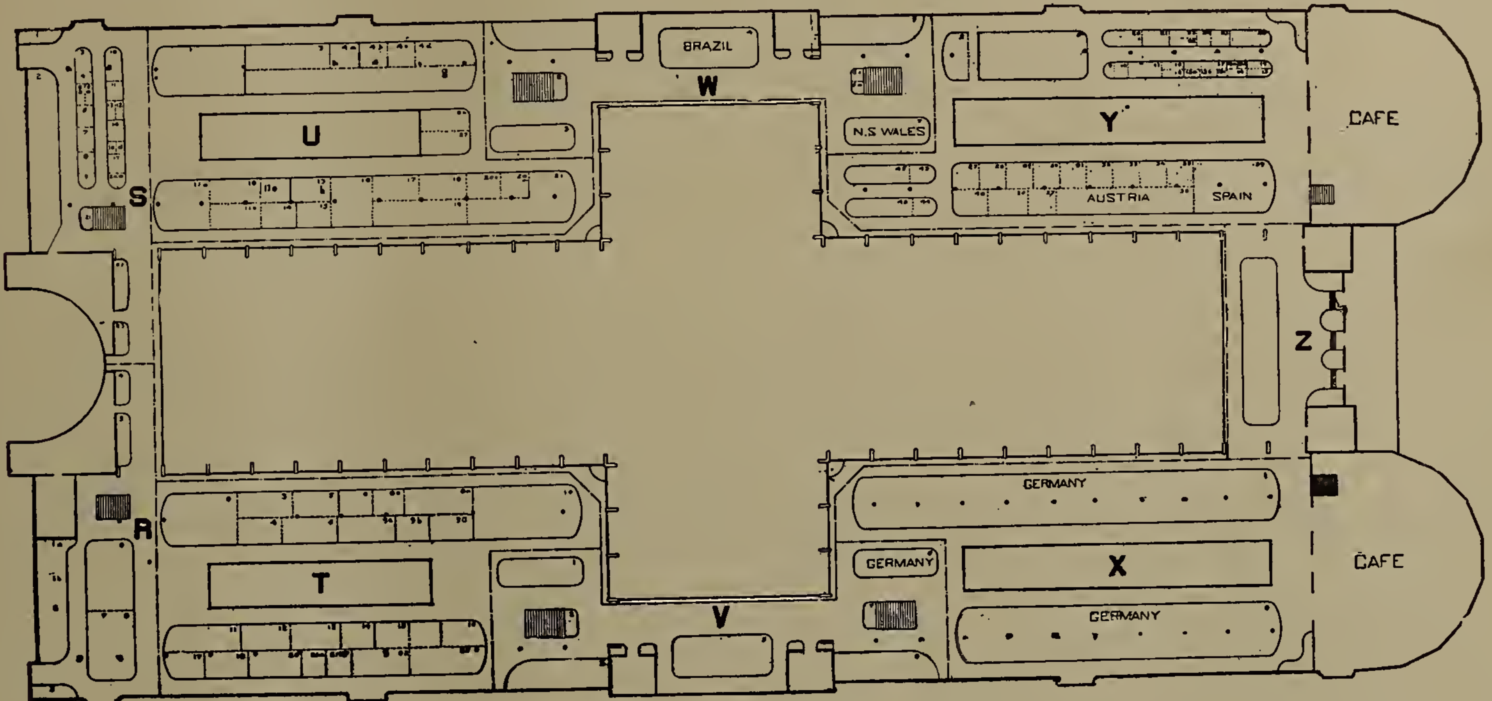


GROUND PLAN OF ELECTRICAL BUILDING.

There is a pavilion at each of the four corners of the building. A light, open spire rises above them to the height of 169 feet. There are two intermediate pavilions bearing low square domes, on the east and west side of the building. The exterior is richly decorated. To illustrate the purpose of the building, the pediments, friezes, panels and spandrils have received appropriate decorations by figures in relief. The general appearance of the exterior is that of marble. Various portions are, however, ornamented by metallic effects.

In treatment it is less nearly classic, more decidedly

Renaissance, than either of the others we have seen, and Corinthian, Ionic and composite orders are all introduced into the design, while a modern and appropriate character is given the details by the constant introduction of electrical tools and symbols. Under the vast archway in the portal which faces the court, and which admits to a great semicircular porch with a domical ceiling, stands a statue of Benjamin Franklin, fifteen feet in height and mounted on a lofty pedestal. The station is a superb one, and the subject unsurpassed, among all American subjects, for historical interest and dramatic suggestiveness. Franklin holds in one hand his kite, which rests upon the ground, and in the other uplifted hand the historical key. But his body and head are thrown back, and he is gazing into the air in a pose which makes us feel that he is trying to play the rôle of Ajax rather than his own. He seems not to be searching the heavens, but to be defying them, and also to be less intent upon mastering his problem than upon impressing spectators with the fact that he is equal to mastering any problem.



PLAN OF GALLERIES ELECTRICAL BUILDING.

In the pediment over the portal which faces the canal is a sculptured group designed by Mr. Richard Bock. But this group does not fill the pediment, either in its width or in its height. Between the group and the apex of the triangle is a wide, vacant space, while on each side of the group stands an ornate pilaster, and beyond this the ends of the triangle are occupied by a scrollwork of acanthus leaves.

The interior of the building is divided by the large nave and transept before mentioned. Above the main floor, galleries each one hundred and fifteen feet wide, at a height of thirty feet from the floor, extend on either side of the building. The ends of these galleries are connected by narrower ones at right angles to them. The floor space of the building is divided into sections, which are allotted to the various exhibitors. Large portions of the space are set aside for exhibits from foreign lands.

A classification of electricity and electrical appliances has been issued by the Columbian Exposition. As this shows the scope and character of the exhibit, it will be of interest here. The following is the official classification :

DEPARTMENT J.

ELECTRICITY AND ELECTRICAL APPLIANCES.

Group 122—Apparatus illustrating the phenomena and laws of electricity and magnetism.

Cass 757. Statical electricity.

Class 758. Thermo electricity ; thermo-electric batteries.

Class 759. Magnets, temporary and permanent.

Class 760. Induction coils, converters, etc.

Group 123—Apparatus for electrical measurements.

Class 761. Standard resistance coils.

Class 762 Standard condensers.

Class 763. Standard batteries.

Class 764. Instruments of precision ; voltmeters, ammeters, wattmeters, etc.

Group 124—Electric batteries, primary and secondary.

Group 125—Machines and appliances for producing electrical currents by mechanical power—dynamical electricity.

Class 765. Dynamos of direct current, constant electro-motive force ; varying quantity.

Class 766. Dynamos of direct current, constant quantity and varying E. M. F.

Class 767. Dynamos of alternating current, constant E. M. F., and varying quantity.

Class 768. Dynamos of alternating current, constant quantity and varying E. M. F.

Group 126.—Transmission and Regulation of the Electrical Current.

Class 769. Cables, wires, and insulation ; rheostats, switches, indicators, registering meters ; ammeters, voltmeters.

Class 770. Safety and protective appliances : lightning rods, lightning arresters, insulators, fusible cutouts, safety switches, etc.

Class 771. Conduits, interior and underground.

Group 127.—Electric motors.

Class 772. Direct constant current.

Class 773. Direct constant E. M. F.

Class 774. Alternating current.

Group 128.—Application of Electric Motors.

Class 775. Street, underground, mining and other railways.

Class 776. Elevators, pumps, printing presses, and general machinery.

Class 777. Toys, novelties, and domestic appliances.

Group 129.—Lighting by Electricity.

Class 778. The arc system, their lamps, fixtures, and appliances.

Class 779. The incandescent systems, their lamps, fixtures and appliances,

Group 130.—Heating by Electricity.
Class 780. For warming and heating apartments.
Class 781. For heating flat irons, soldering irons, and other objects used in industrial operations.
Class 782. Maintenance of constant high temperature in ovens.
Class 783. Electric heating furnaces.

Group 131.—Electro-Metallurgy and Electro-Chemistry.
Class 784. Electrotyping.
Class 785. Electro plating, gilding and nickeling.
Class 786. Electro-deposition of iron and other metals.
Class 787. Electrolytic separation of metals from their ores or alloys.

Group 132.—Electric Forging, Welding, Stamping, Tempering, Brazing, etc.
Class 788. Apparatus for, and methods of forging, welding or joining iron, steel or other metals.
Class 789. Brazing, stamping, tempering, etc.

Group 133. Electric Telegraph and Electric Signals.
Class 790. Various systems of transmitting and receiving.
Class 791. Chronographs.
Class 792. Annunciators.
Class 793. Thermostats.
Class 794. Fire alarm apparatus.
Class 795. Police telegraph and burglar alarm apparatus.
Class 796. Railroad signal apparatus.

Group 134.—The Telephone and Its Appliances. Phonographs:
Class 797. Cables; construction and underground work.
Class 798. Special protective devices.
Class 799. Switchboards.
Class 800. Transmitting apparatus.
Class 801. Receiving apparatus.
Class 802. Signalling apparatus.
Class 803. Long distance systems.
Class 804. Various systems of operation.
Class 805. Subscriber's apparatus: Numbers, code, registers, etc.
Class 806. Phonographs—Receiving and recording apparatus.
Class 807. Apparatus for the reproduction of recorded sounds and articulated speech.

Group 135.—Electricity in Surgery, Dentistry and Therapeutics.
Class 808. Cautery apparatus.
Class 809 Apparatus for the application of the electrical current as a remedial agent—surgical and dental.
Class 810. Apparatus for diagnosis.
Class 811. Apparatus for the destruction of life.

Group 136.—Application of Electricity in Various Ways Not Hereinbefore Specified.
Class 812. Ignition of explosives; gas lighting, etc.
Class 813. Control of heating apparatus by electricity, as applied to steam and hot air pipes and registers.
Class 814. Electric pens.
Class 815. Application in photography.

Group 137.—History and Statistics of Electrical Invention.
Class 816. Objects illustrating the development of the knowledge of electricity and of the application of electricity in the arts.
Class 817 Collections of books and publications upon electricity and its applications.

Group 138.—Progress and Development in Electrical Science and Construction, as Illustrated by Models and Drawings of Various Countries.
Class 818. United States Patent Office and other exhibits of electrical models and drawings.
Class 819. Foreign exhibits of electrical models and drawings.

Since the above classification was issued, another group has been added. Under this group a variety of apparatus either properly electrical or auxiliary to other exhibits, essentially electrical in character is fully covered. This new group is as follows:

Group 138 "A"
Class *a*—Construction tools, repairing tools, apparatus used in electrical construction.
Class *b*—Apparatus for transmission of power to electrical generators. (Steam, compressed air, turbine, oil, friction, gearing belting, etc., etc.
Class *c*—Processes of electro-engraving.
Class *d*—Carbon and its applications.
Class *g*—Metals and their application in the construction of electrical apparatus.
Class *h*—The "Kinetograph."
Class *j*—Direct coupled engine dynamos.
Class *k*—Electric lubricators.
Class *l*—Application of electricity in testing and ageing liquors.
Class *m*—Electric tanning.

THE TELEPHONE AT THE WORLD'S FAIR.

The Chicago Telephone Company has perfected elaborate plans for the complete installation of a working exchange and subsidiary lines at Jackson Park.

The plans include the furnishing of 300 telephones for use between the different departments and as many public and private telephones as may be required by exhibitors in the various buildings. Each separate installation includes copper metallic circuits and the long distance equipment that is so popular, and with the public instruments will be provided the comfortable booths that shut out all sound. Then, to relieve the subscriber from the unpleasant features of retardation so noticeable in the city lines, and which is largely due to conditions existing in the down-town conduits, connection by means of a belt line is made to the long distance circuits extending to the north and west as well as to the east, at some point near the city limits.

Then there is at least 100 trunk lines directly connecting the exchange in Jackson Park with the Chicago exchange, thus affording easy telephonic communication to or from all parts of the city without interruption to main trunk lines or interference with the regular city calls. This cable is placed in the subway.

These lines leave the Chicago exchange in the form of a single cable of 100 pairs that is laid in the telephone subway to Fifty-second street, where it is divided into two cables of 50 pairs each and carried on the handsome pole lines to Jackson Park.

The possibility of a demand not arising for this work has not prevented the preliminary wiring from being done, and telephone cables have been carried into every building and headed up so that when required service wires can readily be extended.

Mr. W. S. Ford, of the engineering staff of the American Bell Telephone Company, of Boston, is the genial and efficient engineer in charge of this work.

ELECTRICAL SOCIETIES.

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES.

On May 5, Mr. William S. Barstow will lecture before the Department of Electricity, on the subject of "Electric Meters."

THE WESTERN ELECTRIC COMPANY.

Of Chicago's many electrical concerns probably there is none so extensively known as the Western Electric Company. There is not a single department of electrical industry for which this company does not make a full line of instruments, and in every civilized country on the face of the globe instruments of some class of its manufacture are found. It is an extensive manufacturer of telephone apparatus of all kinds, and besides these instruments, telegraph instruments of every description, electrical measuring instruments for all purposes, electric light and electric railway apparatus and material, including its own dynamos and generators, and motors, are manufactured by it.

To enumerate all of the instruments of the different classes this company makes would fill a large volume, hence it is obviously impossible to describe and illustrate more than a very few in the space at our command.

Among the incandescent lighting apparatus manufactured by the Western Electric Company may be mentioned, the constant potential dynamo of which an illustration is given herewith. This class of dynamo is made in 10 sizes ranging from 30 to 900 amperes at 110 volts, and from 2,600 to 450 revolutions a minute. The 900 ampere machine has the slowest speed, viz., 450 revolutions, and in size over all is 100 × 114 inches, requiring a 14-inch double belt. By the construction of these machines, the highest efficiency is attained; the pole pieces are massive; the bearings ample, and there is great length of commutator surface. The machine rests on a sliding, adjustable base, for the purpose of regulating the belt tension. These dynamos are made in a first-class manner in every respect.

The combination board is adapted for small to medium-sized isolated plants, and is very compact. The switches, fuses and indicating instruments are mounted upon a marble or slate slab, the rheostat being placed in the rear and so arranged as to be controlled from the front. All wiring is concealed and the board is surrounded by a neat hardwood casing, which supports the marble.

The rheostat is non-combustible, and consists of a cast iron box, supporting porcelain insulators, to which German silver resistance coils are attached. The front of the box is covered with glass for the purpose of excluding dust and dirt, and at the same time allowing ready inspection.

The ammeter and voltmeter, two different instruments. are shown in the accompanying illustrations. The ammeter is direct reading, durable, dead beat, and may be left in circuit permanently without danger of over-heating; the voltmeter possesses the same qualities, and as it has no permanent magnets it needs no recalibration, and is said to be absolutely reliable. The ammeters are made from 50 to 600 amperes capacity, while the voltmeters range from 120 to 600 volts.

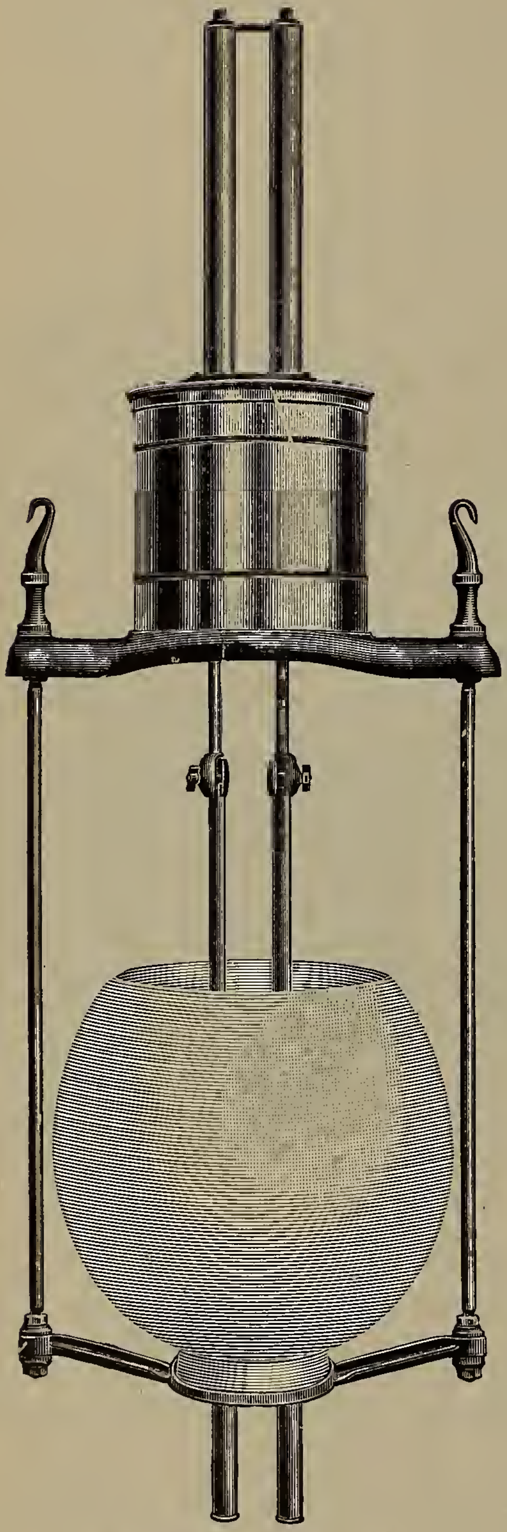
BIRD'S-EYE VIEW OF FACTORY OF THE WESTERN ELECTRIC COMPANY, CHICAGO.

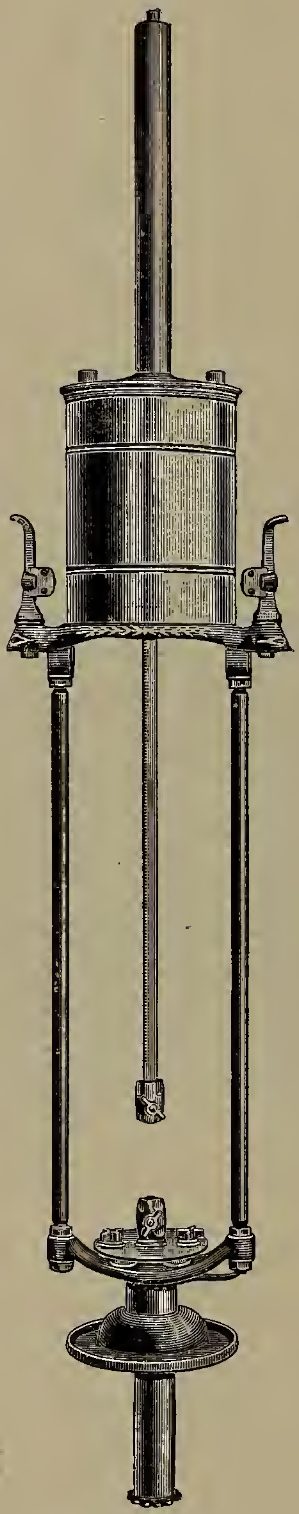
The double pole switch cut-out is of new design, and especially adapted for use in the mains, feeders and subfeeders of incandescent systems; the switch breaks either pole independently, making a quick break, and the connections do not become loose or open by the jaring of the building.

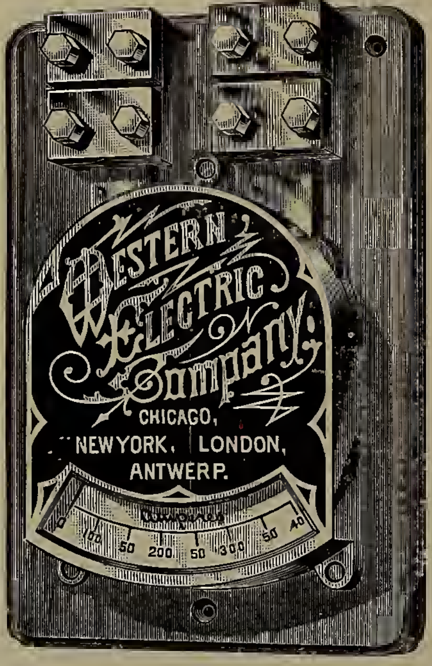
The main wall switch is simple and solid in construction, and is easily put in circuit. It is made in sizes designed to carry from 150 to 400 amperes, and single and double pole.

The arc light systems of the Western Electric Company are complete in every detail, and each piece of apparatus possesses special features. The company manufactures apparatus for both high and low tension direct current arc light systems, and the dynamos for each class have stood the test of time excellently well, and it is claimed are unexcelled by none in respect to every essential point. They are constructed with scientific accuracy in their electrical and mechanical design, and are said to be highly efficient in practical operation. They are also of compact pattern, and the armature is of special construction, having but few parts, easily accessible. By the company's method of winding the armature, highly economical results are attained, and there is no danger from damaging heat under any circumstances.

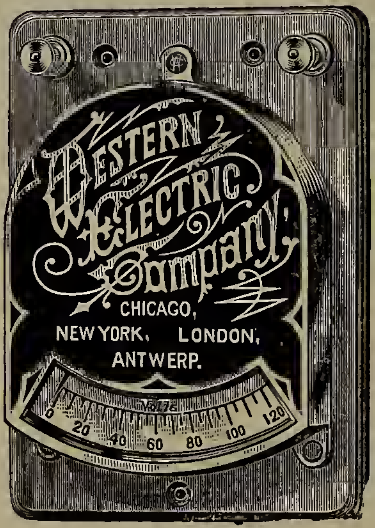
The company manufactures a variety of arc lamps. They are different in construction and operation from those of any other system. By their simplicity of construction there is minimum liability to derangement from wear, corrosion or other causes, and at the same time perfect regulation and a steady and uniform light are secured. All the working parts are enclosed and protected from the weather and dust, and the automatic cut-out is prompt and effective in operation, cutting the lamp out of circuit when the carbons are consumed, or the arc becomes too long. The accompanying illustrations are of this company's Monitor double lamp (wide-frame), and arc lamp for use with continuous current incandescent system. Besides these, single carbon lamps of various styles are made. Each and all of these lamps represent the best of their particular class, economy of maintenance, etc , being the principal claims made for them


MONITOR DOUBLE LAMP.

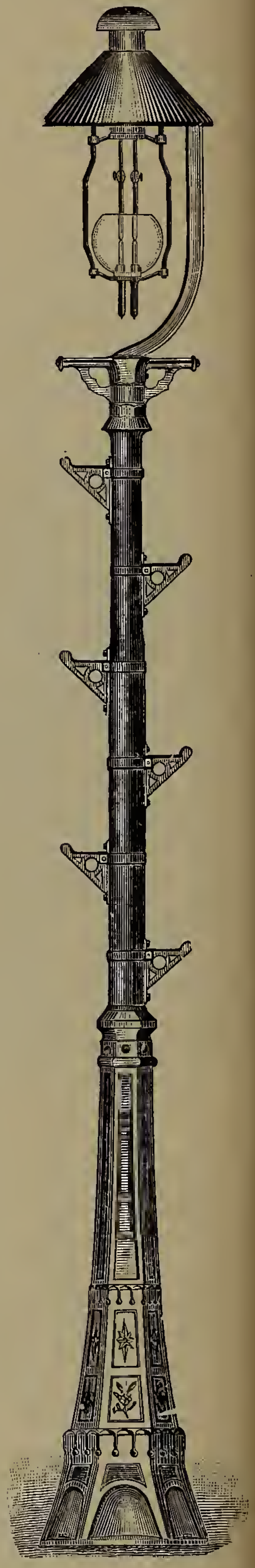

ARC LAMP FOR INCANDESCENT CIRCUITS.



AMMETER.



VOLTMETER.


"COLUMBIAN" STREET LAMP POST.

We give also an illustration of the "Columbian Street Lamp Post," patented. This post, it will be noticed, is of very pleasing design, the lower part having a broad circular iron base which, when bolted to the sidewalk, gives the post great stability. One of the panels of the base is hinged for the purpose of giving access to the switch. The portion of the post above the base is of wood, which extends through the base to the sidewalk. Neat malleable iron steps are provided, and the height of the post is 21 feet over all. There are about 1,000 poles of this general design now in use in Chicago.

A view of the Western Electric Company's factory in Chicago accompanies this article. It is located on South Clinton street, covering Nos. 227 to 275, and is most substantially constructed. The Company also has an immense factory building in New York City, at the corner of Thames and Greenwich streets, and has agencies in London, Antwerp, Berlin and Paris.

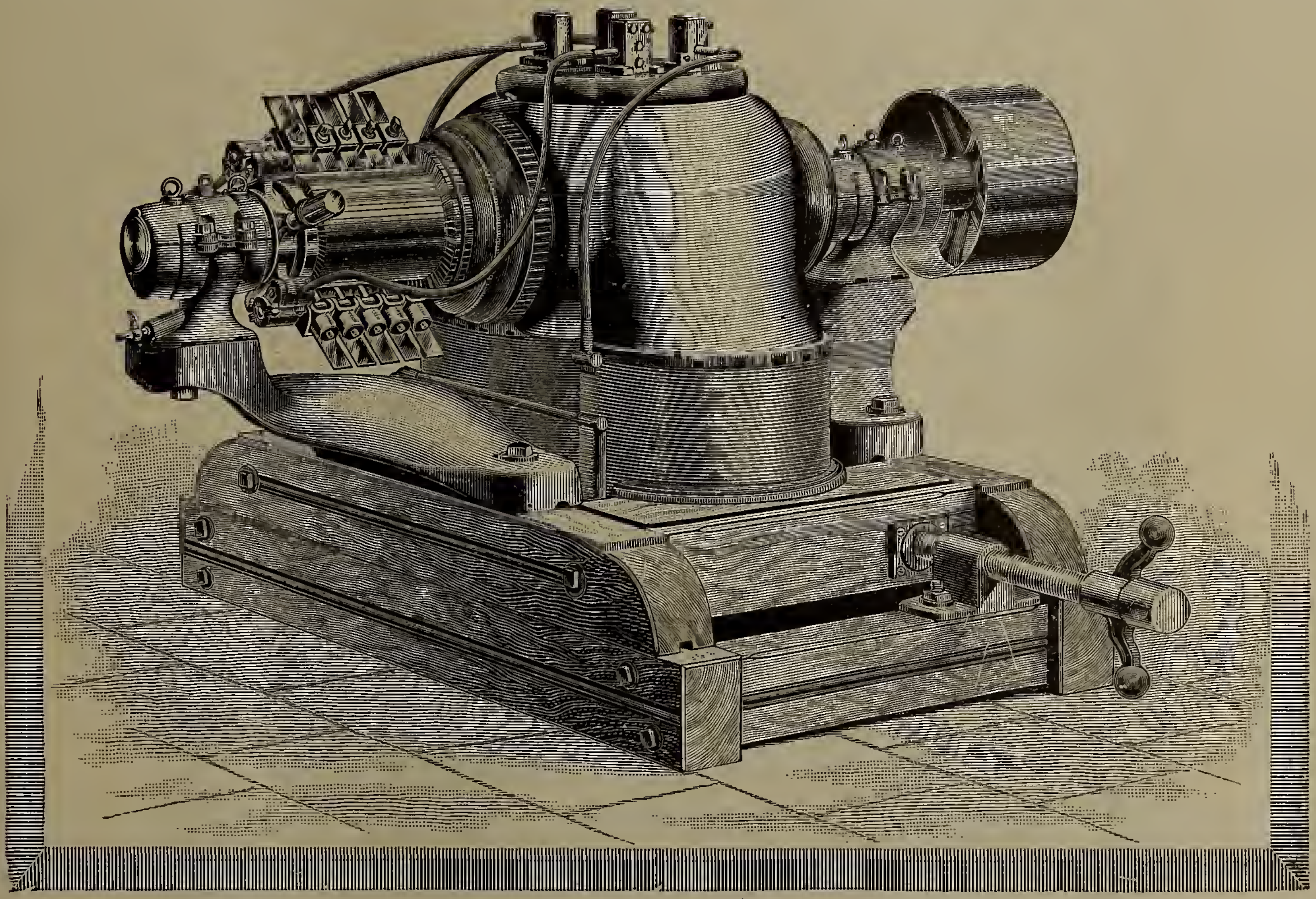
TEMPERATURE, WATER AND STEAM PRESSURE RECORDERS.

The Todd, Applegate Co., manufacturers and sole agents of Portable Time Temperature, Water and Steam Pressure Recorders, 340–342 Dearborn Street, Chicago, will have two exhibits at the World's Fair—one in Electricity Building, and a steam pressure recorder in Machinery Hall. These recorders are said to be the only known instruments applicable where accurate temperature, steam and water pressure is required. The records are printed in plain Roman characters, giving the date, time and temperature or pressure at stated intervals of time. The Telemeter is about eight inches square, inclosed under cover and secured by Yale lock, which prevents any tampering.

Frequently overtaxed, unsound, or weak boilers are used in violation of all laws of safety; explosions occur; death and destruction of property follow. An instrument that will leave an accurate and complete hourly or half-hourly printed record of exact steam pressure, that will stand in any court of law, would conclusively prove whether the boiler was overtaxed. The Todd, Applegate Co.'s Time Steam Pressure Recorder meets these requirements, and is in every sense a most reliable Telemeter. The temperature recorders are applicable to cars in which perishable freight is being transported; cold storage warehouses, etc. The company's large factory is running at full capacity turning out these recorders.

THE STANDARD PAINT COMPANY, NEW YORK.

The Standard Paint Company, of No. 2 Liberty Street, New York City, will have an elaborate display of its well-known P. & B. compounds, paints, etc., in Electricity Building. Its space comprises 400 square feet in which P. & B. products for electrical purposes will be very effectively displayed. At the rear of the space is the trade-mark of the company executed in colors on plate-glass. This glass has a diameter of six feet and will be draped with the American colors and the municipal colors of Chicago. Behind the glass plate will be placed an arc lamp which will illuminate the disc, bringing out all of the devices and colors with brilliant effect. Another feature of the exhibit is a platform about two feet high, the two front steps of which are made of glass, forming a show case. Within are arranged samples of P. & B. goods in various designs, and on the outside of the platform goods are arranged in mounds and other shapes with very artistic effect. To Mr. P. H. Hover, the company's Chicago agent, is due much of the credit for the excellent arrangement of the exhibit, and to Mr. F. S. DeRonde, the popular general sales agent of the company, is due the credit for the conception and design of this attractive display, which was carried out under his own supervision. Mr. DeRonde spent considerable time in Chicago in making preparations for the exhibit.



WESTERN ELECTRIC COMPANY'S CONSTANT POTENTIAL INCANDESCENT DYNAMO.

THE ELECTRIC SELECTOR AND SIGNAL COMPANY.

The Electric Selector and Signal Company, of 45 Broadway, New York, will make in the Department of Electricity, space U 19, a complete exhibit of the principle of individual electrical selection in its several applications. The space allotted to the company has a frontage of 50 feet on the main balcony, thus affording ample room for the display of its specialties. There will be shown in operation, on a scale and under the conditions of every-day practice, a number of railroad semaphores and train order signals, six telegraph stations, six arc lights, several groups of incandescent lamps, four electric motors and a telephone circuit with four or five stations. At one end of the space will be a stand representing a central light station at which will be located the transmitter for cutting in and out the electric lights and motors, and at the other end will be a similar stand representing a railroad train dispatcher's office from which the various signals and telegraph stations will be controlled. The instruments and appliances while of standard pattern have all been finished ornamentally and all the wood-work will be of natural varnished wood, thus heightening the effect, and making a display which it is believed will be as attractive to the casual visitor as it will be interesting to railroad and electric light men.

THE CENTRAL ELECTRIC COMPANY.

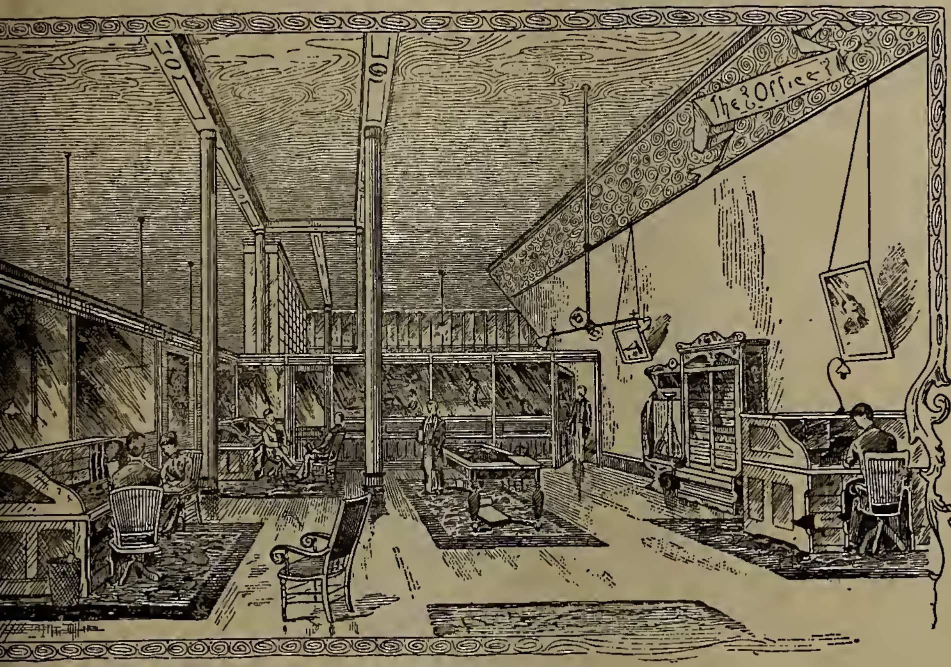
The Central Electric Company, of Chicago, manufacturer, importer, and jobber of electrical supplies, is one of the most prominent and widely known supply houses in the West, and occupies commodious quarters at Nos. 116 and 118 Franklin street, an illustration of the company's office building being shown herewith, which, in addition to its large warehouse, gives unexcelled facilities for handling its rapidly increasing business. This company was organized six years ago, and first located at Nos. 38 and 40 La Salle street, occupying only the second story of the building. The business rapidly developing compelled it to seek more commodious quarters, and in a short time it leased the five story building at No. 42 La Salle street. Three years ago the company moved to its present quarters, where, from time to time, it has been compelled to add to its force until now it gives employment to between fifty and sixty persons in its various departments.

CENTRAL ELECTRIC COMPANY'S BUILDING, CHICAGO.

The president of the company is Mr. Wm. H. McKinlock, who has been identified with the electrical business for some fifteen years, and was formerly secretary of the Detroit Electrical Works.

In order to better care for its many specialties, this company has opened three branches, one named the Southern Electrical Supply Company, located at St. Louis, with Mr. Chas. E. Sharp as manager; another, the Gate City Electric Company, at Kansas City, Mr. W. D. Greene, manager, and the third, the Western Electrical Supply Company, at Omaha, G. W. Johnston, manager.

By establishing these depots of supplies in the above named cities and equipping them with complete stocks, the company has been enabled to materially assist in the development of the electrical business in these centres. Prominent among the specialties which the Central Electric Company controls and pushes in connection with its branches, are the Okonite products, such as lead and armored cables, braided and plain Okonite wires, Okonite and Manson tapes, Okonite tubing; the Interior Conduit Company's complete system of conduiting, both plain and brass covered; the Lundell power and fan motors and exhaust fans; the Johnson switches; Banner high-grade weatherproof wires; the Cleveland arc cut-outs, and the Hart snap switches, single, double pole and three way.



OFFICES OF THE CENTRAL ELECTRIC CO.

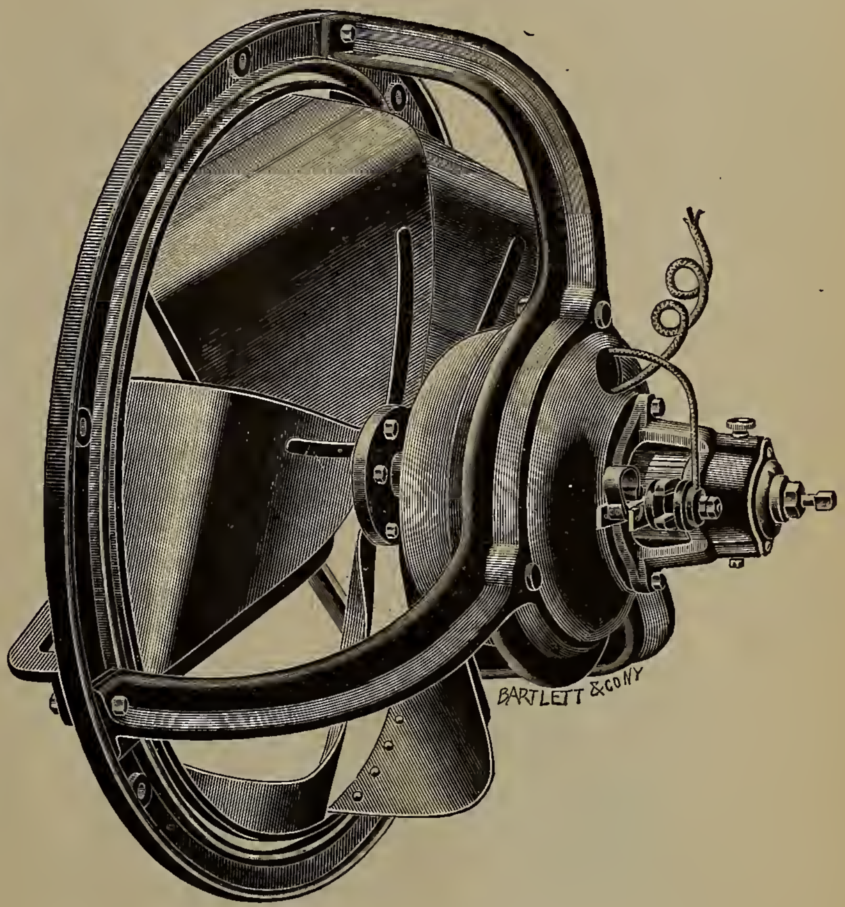
The Central Electric Company has recently been appointed agent for the United States for W. T. Goolden & Company, of London, England, manufacturers of fine laboratory, station and marine voltmeters and ammeters, and in addition to these the company handles and carries in stock a complete line of the widely known Weston instruments of both the large station type and the compact highly finished portable sets.

This enterprising company owns and operates one of the largest pin and bracket factories in this country, situated in the heart of the choicest oak timber district, and is thus enabled to put upon the market nothing but the most perfect split oak products.

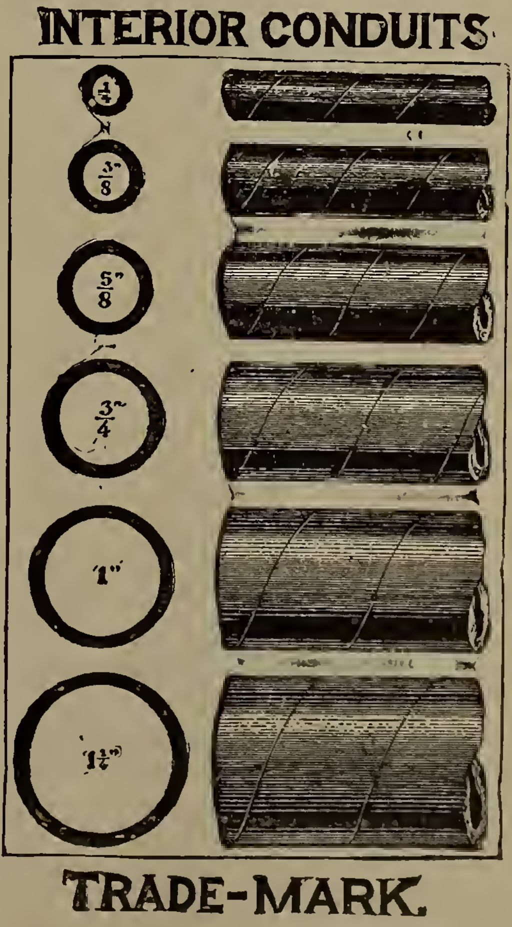
SALESROOMS OF THE CENTRAL ELECTRIC CO.

By close relations with the cutters of selected pole stock and purchasing this class of material on the ground, it is necessarily in position to quote live peeled timber at bed rock figures.

What with close purchases on glass insulators, and the quick sales of large quantities of its well-known Banner weather-proof wire at factory prices, it has been enabled to handle enormous amounts of line and construction material, and has, it is said, proven to many a central station contractor that it is pre-eminently the establishment with which to place large orders for the above named material, this being especially true when time delivery is an important factor.



VENTILATING FAN AND LUNDELL MOTOR.



The Central Electric Company is also the agent for the Washington Carbon Company, claimed to be the only concern outside of the trust making high grade molded carbons, and from the first orders to any number of large stations of a sample box, this portion of the business has grown to be an important factor, and several carloads per month are scattered throughout the West from the Chicago warehouse

Appreciating the complaints which have been made regarding the number of screws which the ordinary make of socket requires, this company has put upon the market a new socket which contains no screws, except the binding screws, all the parts being riveted.

This company is publishing monthly in connection with the Interior Conduit and Insulation Company of New York City, for whom it is the Western agent, what it fitly terms the "Architects' Electrical Bulletin," which briefly gives mention of the prominent buildings throughout the country which have been equipped with the complete system of conduiting and wired with Okonite wires, also showing illustrations of the buildings themselves and giving the opinions of the various best known electrical engineers and contractors as to the most approved methods of placing the conduit in position and drawing in the wires. The March bulletin contained short descriptive articles furnished by such well-known experts as Charles G. Armstrong, George J. Percival, L. A. Ferguson, L. K. Comstock, and others. This bulletin is being sent free every month to every prominent architect and electrical contractor in the country. The March bulletin contained ten pages of closely-printed matter and illustrations as mentioned above. The Central Company points with pride to a few of the prominent large buildings in its city, which are equipped throughout with conduit and wired with Okonite, such as the Lakota Hotel, 3,000 lights; Ellsworth Building, 3,500 lights; Chicago Athletic Club, 4,000 lights; Columbus Memorial Building, 5,000 lights; Marshall Field & Company's new retail store, 4,500 lights; Chicago Art Institute, 2,500 lights; Chicago Club, 1,500 lights; Windemere Hotel, 2,500; Congress Hotel and Auditorium Hotel, 17,000 lights.

OKONITE

TRADE MARK.

The Central Electric Company as absolute general western agents of the Okonite Company, has recently secured some very large orders for 300,000 and 500,000 circular mil cables, one notable order having recently been placed for a mile of three conductor cable, each conductor to be of half a million circular mils capacity. To properly manufacture a cable of this size necessarily requires elaborate and special machinery and unusual facilities in the way of testing, all of which the Okonite Company possesses.

The new 500-page catalogue which the Central Electric Company is publishing will contain an elaborate line of choice designs in fixtures and this special department will be vigorously pushed.

The motor business under the supervision of Mr. H. H. Small is already assuming a prominent position and several power motors were put into active service recently.

The Central Electric Company desires to extend to all a cordial invitation to call at its headquarters when in Chicago and promises the same courteous treatment whether the call is made simply to look over its well selected stock, to secure prices, or to place an order.

It may be well to bear in mind that this company has private wires connecting with the Postal Telegraph Cable Company, and the Western Union Telegraph Company, and its own operator, thus avoiding the usual delays in transmission of rush orders.

TAYLOR, GOODHUE & AMES.

We illustrate herewith some of the specialties handled by Taylor, Goodhue & Ames, Monadnock Block, Chicago, Ill. This firm, while in business only about six months, has secured control of a number of very desirable specialties which are meeting with a ready sale.

Figure 1 illustrates the now well known Diamond Transformer which has become so well and favorably known in all sections of the country. The illustration represents the transformer with the fuse box open. The advantages claimed for this transformer are that besides being of electrical superiority, it possesses mechanical features which readily commend it to the practical central station man. The hooks attached to the back of the case enable these transformers to be readily attached to a cross-arm, or if it is desired to place upon a building the hooks may be readily removed. The coils are well ventilated through the top and bottom of the case, besides which should a burn-out occur in the primary

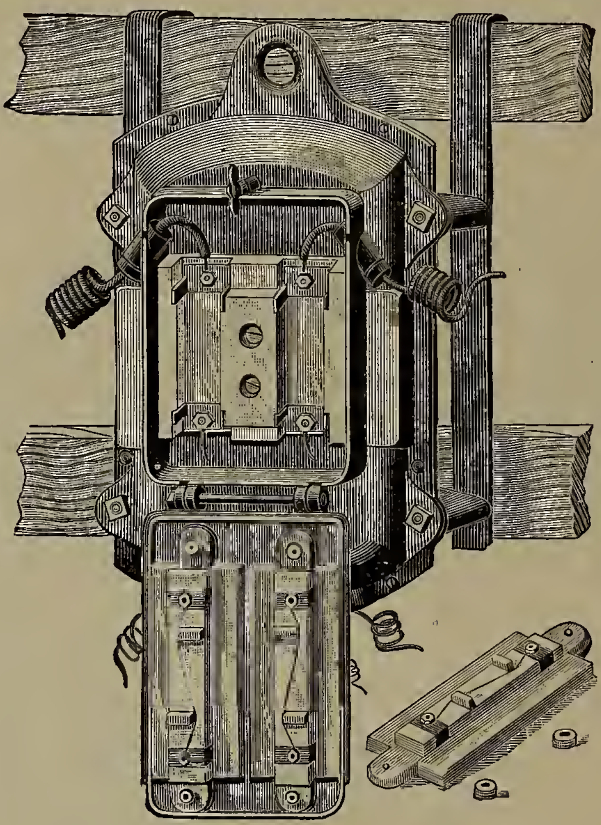


FIG. 1. DIAMOND TRANSFORMER.

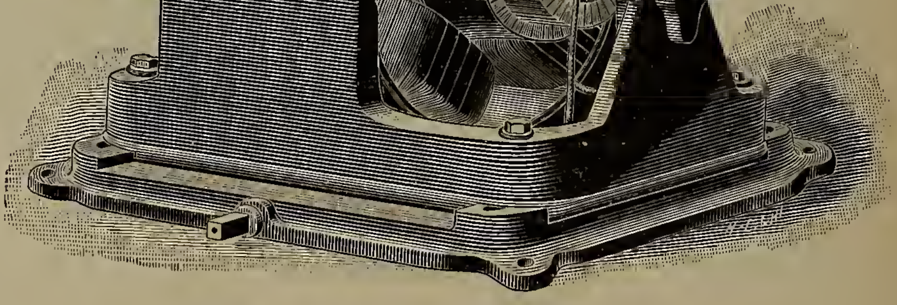


FIG. 2. WAGNER ELECTRIC MOTOR.

coil, it may be easily removed and replaced at the central station without the necessity of returning it to the factory. The primary coils are constantly kept in stock and can be expressed without delay. It will be seen that this arrangement will save the central station much time and expense just at the time when they are the least prepared for either. The arrangement of the fuses is well illustrated in the cut. As will be seen the fuse blocks are attached to the door of the fuse box itself so that a lineman can replace the fuses on a live line without danger.

Figure 2 illustrates the Wagner electric motor for direct current. This motor is also made for alternating current and is said to be the only motor at present on the market that can be used in connection with an alternating current lighting circuit.

These machines are self-exciting and will readily start on something over $\frac{1}{3}$ load. With self-oiling bearings, low centre of gravity and adjustable brushes, besides being of handsome appearance, they should commend themselves to those in need of motors. Taylor, Goodhue & Ames have already sold a number of them and are constantly receiving communications from all sections of the country regarding them.

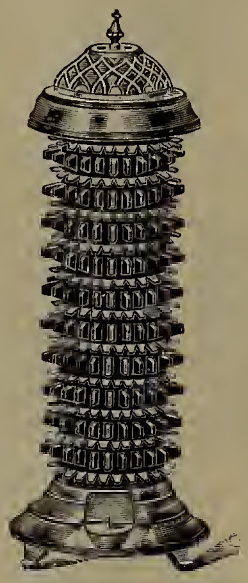


FIG. 3.—ELECTRIC STOVE.

Figure 3 illustrates the new electric stove manufactured by the Burton Electric Co., of Richmond, Va., and placed upon the market by Taylor, Goodhue & Ames. This heater is somewhat of a new departure in electrical heating and commends itself to the purchaser by reason of the fact that there is a switch attached to it whereby the amount of current consumed can be regulated as well as the amount of heat generated. By means of this switch, the stove can be made serviceable for cool and chilly weather and also for severely cold weather. The stove is about $3\frac{1}{2}$ feet in height, with the body painted black with nickel top and bottom. It will be seen by the illustration that the radiating surface is largely increased by means of the projections from the body of the stove. Taylor, Goodhue & Ames claim that they have already received extensive correspondence in reference to this stove from all parts of the country and are prepared to fill orders very promptly.

Taylor, Goodhue & Ames are prepared to furnish any of these specialties or general line of goods on short notice.

PERSONAL.

Mr. W. C. Badger, of the T.-H. International Company, sailed from New York on May 1, for Rio de Janeiro, Brazil. Mr. Badger has been appointed assistant superintendent of the Jardine Botanica Street Railway Company, Rio de Janeiro. He gave us a call prior to his departure.

MOSHER ARC LAMPS.

Among the foremost arc lamps in the market none is better known than the new Mosher lamps for direct and alternating currents. These lamps represent tireless patience, scientific experimentation and practical tests for four years, hence the company has good reason to claim that its lamps are incomparable.

In the construction of these lamps both clutch and clock feed are used, the clutch for multiple arc lamps and clock for series lamps, and on account of the simplicity of the feeding mechanism these lamps merit popular favor. The lamps are automatically cut-out of circuit when the carbons are burned out, by switches, cut-outs, etc., with which they are provided, and the company claims that its lamps will answer all purposes and work successfully under all circumstances.

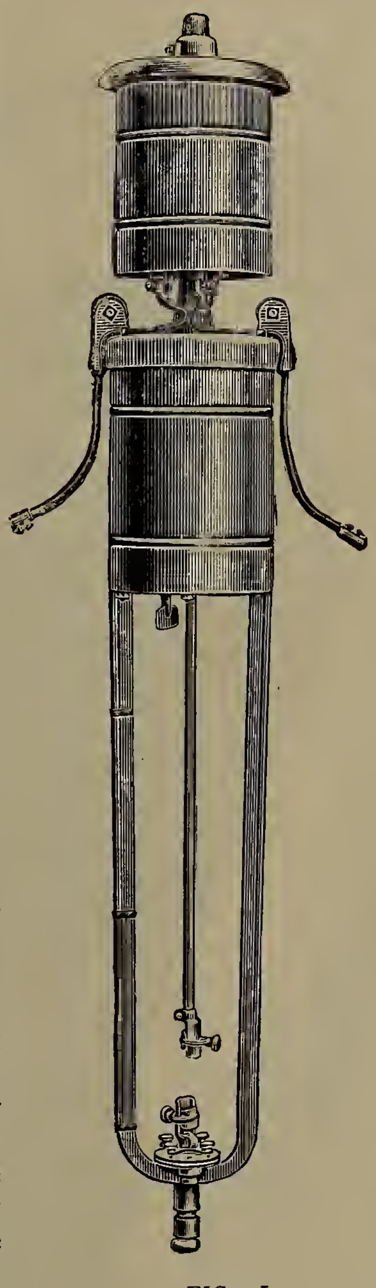


FIG. 1.

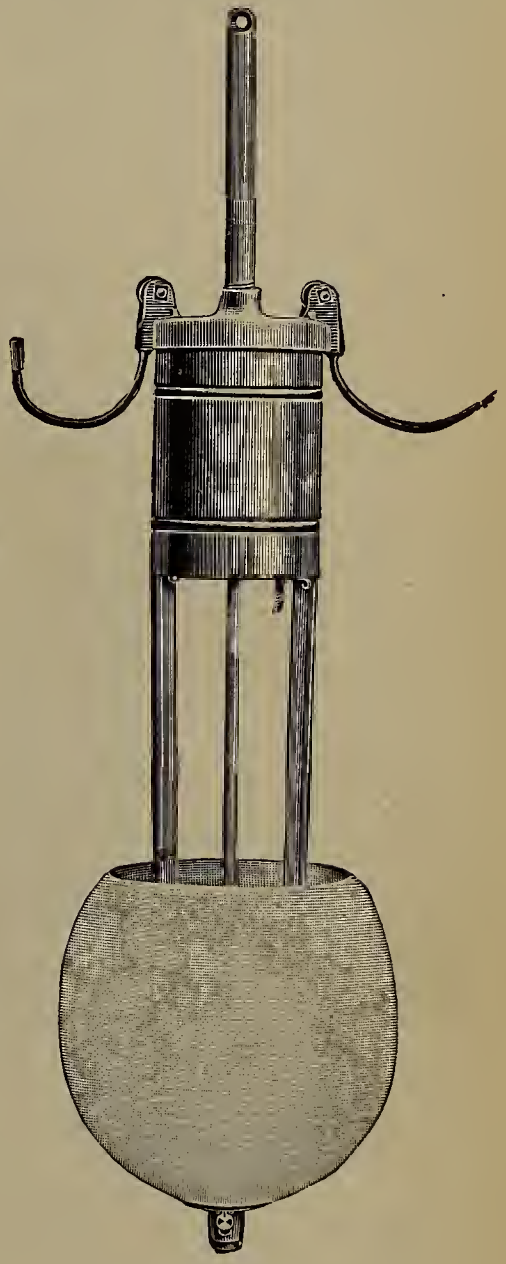


FIG. 2.

Fig. 1. shows the lamp with the rheostat mounted on the frame. This lamp burns singly on from 50 to 125 volts, and is furnished with either clock or clutch mechanism. It can also be used for out-door purposes.

In Fig. 2 is shown the Mosher railway arc lamp. These lamps can be made to run from 5 to 10 in series on a 500 volt railway circuit. They are constructed with a rack feed and are wound to vary from 6 to 10 amperes, according to the light desired. The feeding mechanism is controlled by separate magnets, one shunt, and one main circuit, which releases the escapement and allows the lamp to feed only when the arc has passed beyond, or attempts to use more than its proportionate share of the voltage of the system on which the lamp is run. The main circuit magnet is wound in such a relation to the derived circuit, that when the lamp is regulated for a certain amperage, it will be impossible for the amperage to vary very much from the amperage for which the lamp is regulated; that is, if the lamp is regulated for seven amperes and the voltage of the system should decrease the seven ampheres would be practically maintained, thus preventing the arc of the lamp being broken by reason of insufficient pressure If the voltage should increase, the lamp would not feed until the current had reached the normal, or seven amperes. So it is almost impossible to burn a lamp out. It will be seen that this regulating magnet can be made as sensitive as it is possible to be made, as vibrating or pumping of this magnet will not interfere with the arc, and it is therefore unnecessary to use a dash-pot.

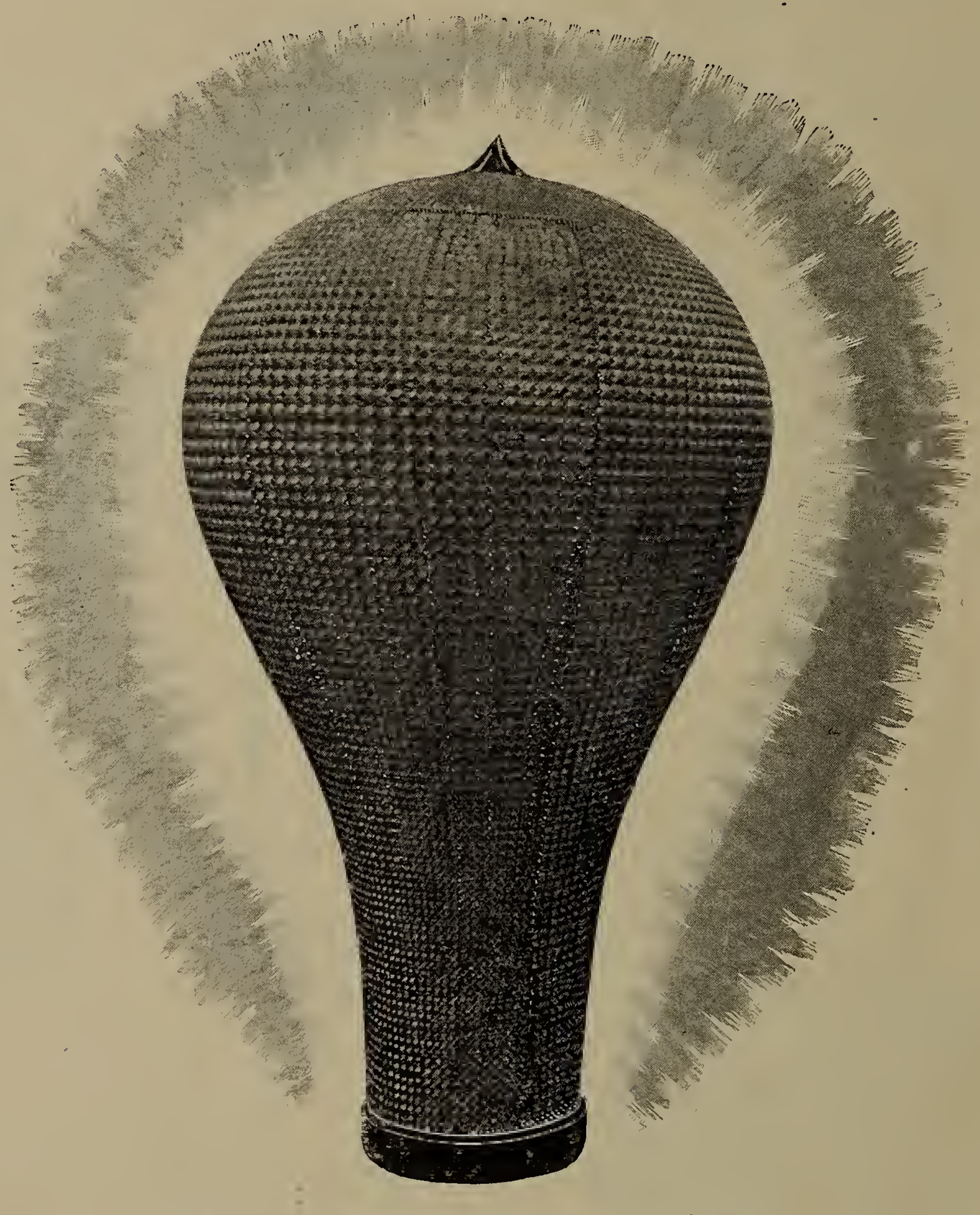
A test of this lamp showed that the feeding mechanism works almost perfectly, and that the feed is constant in proportion as the carbon is consumed.

The officers of the Mosher Electric Co. are: G. L. Reimann, president; J. A. Mosher, vice-president, and J. A. Sheriffs, secretary and treasurer. The company's headquarters are at No. 125 Ontario street, Chicago.

Electric lighting companies at Toledo, Ohio, have been enjoined from erecting poles or stringing any wires, save by the express permission of the proper city officials.

GREAT PRISMATIC INCANDESCENT BULB IN THE ELECTRICITY BUILDING, WORLD'S FAIR.

One of our contemporaries published a view of the General Electric Company's Exhibit in Electricity Building at the World's Fair. At the top of the column in the exhibit was a prismatic electric bulb, made by F. McLewee & Son, 25 Waverley Place, corner Greene street, New York City, and not by the firm mentioned in the article in question. This prismatic electric bulb is ten feet high by four feet wide, at its greatest width, and consists of 40,000 cut prism heads. These prisms are made of cut glass, are only about three-fourths of an inch in diameter and ground like a diamond. To place each one into position required the services of two men, one working inside and one outside of the bulb frame. The frame is made of angle iron and covered with a wire hood, the shape of an incandescent lamp. The prisms were attached to the outside of the wire hood, and it took eight men five weeks to construct the bulb. Each prism was fastened with copper wire in order to avoid corrosion, this being the best metal for such purpose. The weight of the bulb complete was 1,000 pounds.



PRISMATIC INCANDESCENT BULB AT THE WORLD'S FAIR.

Messrs. McLewee & Son were organized in New York City over fifty years ago, and have always carried on the business of manufac turing fixtures, making illuminated signs and novelties in lighting a specialty. This firm has become popular through its special work, and it was owing to its vast and practical experience that it was so successfully able to represent on so large a scale an Edison incandescent lamp. As showing the care with which the details of this bulb were worked out, it is interesting to state that its surface was developed from that of an ordinary lamp, thus preserving the exact curvature of the original.

This firm is also an extensive manufacturer of electric combination and gas fixtures for private and public lighting. Its designing department, under the charge of Mr. H. F. D. Crownfield, will be pleased to submit designs in all styles to architects and owners, or figure on submitted designs.

ELECTRICAL EXHIBITORS AT THE WORLD'S FAIR.

The following is a list of the electrical exhibits in Electricity Building at the World's Fair, with the location of each.

The floor space of the building is divided into sections which are designated by the capital letters, and each section is subdivided into spaces designated by numerals. Where no space is designated in the list the exhibitor exhibits with some one else.

	SEC.	SPACE.
Ansonia Elec. Co., Chicago	Z	1
American Bell Telephone Co., Boston, Mass.	G	1
Anthony Elec. Inst. Co., Chicago	M	1, 2
Arnold Mfg. Co., Chester, Pa	E	4
Amer. Graphaphone Co., Washington, D. C.	S	14
American Battery Co., Chicago	T	14
American Engine Co., Bound Brook, N. J	..	..
Acme Filter Co, St. Louis, Mo	..	..
Brooks, R. T., New York	T	22
Brush Elec. Co., Cleveland, Ohio	L	6, 7
Billings & Spencer Co., Hartford, Conn	Y	24
Bemis Car Box Co, Springfield, Mass	..	..
Briggs Orlands, Chicago	..	..
Burton Elec. Co., Richmond, Va		
Belknap Motor Co., Portland, Maine	E	2
Bottome Turner D., Indianapolis, Ind	T	13 r
Brady, T. H., New Britain, Conn	Y	45
Brixey, W. R., New York	T	2
Bates Mfg. Co., New York	Y	43
Benham, A. D., Chicago	S	16
"C. & C." Elec. Motor Co., New York	A	2
Cutter, Geo., Chicago	T	3
Casper, Louis, Cheyenne, Wyo	S	21 a
Consolidated Elec. Storage Co., Phila., Pa	T	23
Crocker-Wheeler Elec. Co., New York	L	1
Commercial Cable Co., New York	Y	2
Chicago Elec. Wire Co., of Wilmington, Del.	T	15
Cleveland Elect. Mfg Co., Cleveland, Ohio	P	7
Commercial Elec. Co.. Indianapolis, Ind	F	4
Central Elec. Co., Chicago	U	8
Copenhagen Automatic Fire Alm. Co., Chicago	Y	14
Cooper Elec. Heater Co., Chicago	..	..
Chicago Belting Co., Chicago	F	5
Can Engine Co., J. L., New Britain, Conn	..	..
Campbell Elec. Supply Co., Boston, Mass	..	..
Crowell, Gilmer, Brooklyn, N. Y	..	..
Crane Elevator Co., Chicago	..	..
Curtis Elec Mfg. Co., Jersey City, N. J	F	7
Carpenter Enamel Rheostat Co., Bridgeport, Conn	..	..
Devey, Matthew H., Chester, Pa	S	6
DuLaney Clock Co., Chicago	R	5
Detroit Elec. Works, Detroit, Mich	H	1
Deland, Fred, Chicago	Y	28
Diamond Elec. Mfg. Co., Peoria, Ill	..	..
Degenhart F., Chicago	L	5
De La Frere, M., Minneapolis, Minn	T	10
Electrical World, New York	Y	31
Elgin Acoustic Telephone Co., Elgin, Ill	Y	21
Eureka Tempered Copper Co., North East, Pa.	U	14
Electrical Industries, Chicago	Y	27
Electrical Forging Co., Boston, Mass	D	2
Electrical Engineer, New York	Y	32
Electrical Review, New York	Y	31
Electricity Newspaper Co., New York	Y	34
Electric Selector and Signal Co., New York	U	19
Electric Heat Alarm Co., Boston, Mass	Y	15
Eddy Elec. Mfg. Co., Windsor, Conn	B	3
Ele. Adv. & Display Mfg. Co., Philadelphia, Pa.	W	1
Electric Machine Co., Chicago	Y	36
Electrical Appliance Co., Chicago	U	16
Excelsior Elec. Co., New York	B	5
Egan, Chas. E., Englewood, Chicago Ill	Y	37
Empire China Works, Brooklyn, N. Y	S	19
Electro Med. Battery Co., Kalamazoo, Mich.	Y	18 a
Edison, Thomas A., Orange, N. J	J	1
Edgerton, E. M., Chicago	Y	18 b
Elwell-Parker Elec. Const. Co., of America, Chicago	E	3
Elec. Piano and Motor Co., Newark, N. J	S	17
Electrical Conduit Co., New York	P	1
Elektron Mfg. Co., Springfield, Mass	P	4
Elec Gas Co., Boston, Mass	T	13 b
Elliott Elec. Co., Cleveland, O	P	9
Elec. Specialty Co., Denver, Colo	S	21b
Eco Magneto Clock Co, Boston, Mass	..	..
Electric Co, Canton, O	T	8b
Ft. Wayne Elec Co, Ft. Wayne, Ind	M	3
Ford-Washburn Storelectro Co., Cleveland, O.	U	15
Franklin Elec Appliance Co, Boston, Mass.	S	1
Falls Rivet & Machine Co., New York	..	..
Fein, C. & E., Stuttgart, Germany	..	..
Guillaume, Alfred, Chicago	T	4
Gray, Elisha, Highland Park, Ill	W	5
Greeley, The E. S. & Co, New York	F	8
General Elec Co., New York	B4, C1, H2, J1, M4, O3	
Gamewell Fire Alarm Tele. Co., Chicago	V	1
General Fixture Co., New York	..	..
Graton & Knight Mfg. Co., Worcester, Mass.	..	..
Gault & Co., N. C, Winona, Minn	Y	46
Gamewell Fire Alarm Tele Co., New York	..	..
Griffin Wheel & Foundry Co., Chicago	..	..
Hanson & Van Winkle Co., New York	L	4
Heisler Elec. Co., Philadelphia, Pa	O	4
Holmes, Nathaniel L., Ann Arbor, Mich	W	1
Healey & Millets, Chicago	..	..
Hope Elec Appliance Co., Providence, R. I.	Y	11
Hirliman, Chas. J, New York	S	3
Hall, Chas. Fred., Chicago	U	17
Houlehan, Jas., Chicago	Y	9
Hurd, Jno. F., Chicago	S	5a
India Rubber Comb Co, New York	S	11
Illinois Alloy Co., Chicago	Y	19
Ingersoll-Sergeant Drill Co., New York	..	..
International Automatic Lt. & Pr. Co., Chicago.	U	3
Jenney Elec. Motor Co., Indianapolis, Ind	L	2
Johns Mfg. Co., H. W., New York	U	21
Jewell Belting Co., Hartford, Conn	F	6
Jaeger, Chas. L., Maywood, N. J	Y	10
Jackson & Sharp Co., Wilmington, Del	..	..
K. A. P. Elec. Novelty Co., La Crosse, Wis.	V	2
Koch, G. F., Louisville, Ky	S	5 b
Knight Coin Automatic Boot Blacking Co	T	16 b
Leclanche Battery Co., New York	V	7
Lawton, Harry A., & Kennon Mott, Brunswick, Ga	U	4 c
Lincoln, Elec. Co., Cleveland, O	P	8
Lee, Chas. E., Chicago	S	20
Lawrence Machine Co., Lawrence, Mass	..	..

Lake Erie Engineering Works, Buffalo, N. Y.	..	..
Lidgerwood Mfg. Co., New York	..	..
Munson Light'g Conductor Co., Indianap., Ind.	U	12
Marcus, William N., Philadelphia, Pa.	Y	12
Mather Elec. Co., Chicago	M	1,2
Mather, A. C., Chicago	E	5
Munson Belting Co., Chicago	D	4
Merrill Bros., Brooklyn, N. Y.	..	..
Meyrowitz, E. B., New York	..	..
Meeker, Dr. G., Newark, N. J	S	15
Murphy, T. J., New York	..	..
McCaskey, Alfred S., & J. A. Ellis	V	11 b
McIntosh Battery & Optical Co., Chicago	W	3
McNeil Tinder Elec. Co., Winchester, Ky.	U	20 a
McIntosh, Seymour & Co., Auburn, N. Y.	..	..
New York Insulated Wire Co., New York	T	11
National Carbon Co, Cleveland, O.	Y	20
Newman Clock Mfg. Co., Chicago	Y	40
Norwich Insulated Wire Co., New York	T	18
New England Butt Co., Providence, R. I.	T	12
North American Elec. Co., New York	S	12
Non-Magnetic Watch Co., New York	S	23
National Engraving Machine Co., Chicago	S	8
New York Air Brake Co., New York	..	..
National Conduit Mfg. Co., New York	..	..
National Automatic Fire Alarm Co , New York	A	3
North American Phonograph Co., Chicago	S	2
Oehring, A. J., Chicago	..	..
Okonite Co., New York	..	..
Owens, Dr. A., Chicago	U	1
Paiste, H. T., Philadelphia, Pa	S	22
Page Belting Co., Chicago	D	5
Pumpelly, Jas. K., Chicago	T	13
Phœnix Glass Co., Pittsburgh, Pa.	I	1
Phelps, A. H., M. D., Glens Falls, N. Y.	U	20 b
Powell, Wm., Co., Cincinnati, O	U	18
Police Telephone & Signal Co., Chicago	..	..
Pratt Electro Med. Supply Co., Chicago	U	11 a
Pelton Water Wheel Co., San Francisco, Cal	..	..
Platt, O. S., Bridgeport, Conn.	..	..
Pendleton Glass Tube & Pipe Works, Pendleton, Ind	U	4 a
Pass & Seymour, Syracuse, N. Y.	..	..
Queen & Co., Jas. W., Philadelphia, Pa.	E	7
Railway Equipment Co., Chicago	R	7,8
Roessler & Hasslacher, Chem. Co., New York.	S	9
Rauscher, John, St. Paul, Minn	Y	16
Ringler, F. A., Co., New York	R	1 a
Robinson Elec. Truck & Supply Co., Boston.	..	..
Russell & Co., Massillon, O	..	..
Rowell-Potter Safety Stop Co., Boston, Mass.	..	..
Reliance Gauge Co., Cleveland, O.	T	16 a
Rockford Elec. Mfg. Co., Rockford, Ill.	..	..
Standard Underground Cable Co., Chicago	L	5
Sponholz, Carl L., Lowell, Mass	Y	13 a
Standard Paint Co., New York	T	20
Striemer, A., South Superior, Wis	Y	13 c
Sigler, Jas. O., Paterson, N. J	Y	26
Strowger Automatic Telephone Exchange, Chicago	T	7
Sample, H. C., Chicago	S	10
Stanley Elec. Mfg. Co., Pittsfield, Mass	Z	1
Schieren, Chas. A. & Co., New York	D	3
Standard Elec. Signal Co., Rochester, N. Y.	Y	17
Stephenson, John Co., Ltd., New York	..	..
Standard Elec. Co., Chicago	P	2,O1
Sosman & Landis, Chicago	..	..
Star Iron Tower Co., Ft. Wayne, Ind	..	..
Stevens, N. P., Concord, N. H	T	21 a
Street Railway Journal, N. Y	Y	30
Swan Lamp Co., Cleveland, O	..	..
Sperry Elec. Ry., New York	..	..
Todd, John T., Chicago	S	4
Thomson Electric Welding Co., Boston, Mass.	O	2
Thomson-Houston Elec. Co., Lynn, Mass	..	..
Thermo Elec. Heat Regulating Co., Easton, Pa	R	3
Taylor Elec. Truck Co., Troy, New York	..	..
Taylor, Goodhue & Ames, Chicago	A	7
Union Elec. Co., New York	F	3
Utica Elec. Mfg. & Supply Co., Utica, N. Y.	R	4
Union Elec. Works, Chicago	R	1, B 2
Vetter, J. C., & Co., New York	W	2
Vail, W. A., New York	..	..
Van Nuis, C. S., New York	..	..
Western Elec. Co., Chicago	A	4, 5
Washburn & Moen Mfg. Co., Worcester, Mass	V	3
Waterhouse Bros., Hartford, Conn	T	6
Western Electrician, Chicago	Y	33
Weston Elec. Inst. Co., Newark, N. J	R	6
Westinghouse Elec. & Mfg. Cc., Pittsburgh, Pa.	B 1, 2	F 1
Western Union Tel. Co., Chicago	V	8
Wing, L. J. & Co., New York	P	10
Waddell-Entz Co , Bridgeport, Conn	T	17
Waite & Bartlett Mfg. Co , New York	U	26
Willoughby, Chas., San Francisco, Cal	S	13
White, S. S., Dental Mfg. Co., Philadelphia, Pa.	U	27
White, Jas., Glasgow, Scotland	..	..
Webster Mfg. Co., Chicago	..	..
Wharton, Wm , Jr., & Co., Philadelphia, Pa	..	..
Whitney Elec. Inst. Co., Boston, Mass.	..	..
Wagner Elec. Mfg. Co., St. Louis, Mo	..	...
Walworth Mfg. Co., Boston, Mass	..	..
Wilder Fire & Burglar Alarm Mfg. Co., Chicago.	A	6
Zucker & Levett Chemical Co , New York	F	2

GOVERNMENT EXHIBITS.

Austria	Y	38
Brazil	W	4
Canada	P	6
England	O	5
France	Q 1, J 2, K 1,	P 3
Germany	X 1, 2, V 5, 6, D 1,	E 1
N. S Wales	W	7
Russia	O	6
Spain	Y	39
Monaco	Y	8

RELIANCE SAFETY WATER COLUMNS.

One of the neatest and most attractive, as well as the most extensive exhibits of auxiliary appliances in the Electricity Building, is that of the Reliance Safety Water Columns, exhibited by the Reliance Gauge Company of Cleveland, O., which occupies space 5 in section T, on the main aisle of the second floor to the right of the entrance, overlooking the floor below. The space occupied is 23½ ft. long by 14 ft. deep, and columns of all sizes, from those for the smallest house-heating boiler to the largest vertical boiler, and consisting of japanned, finished brass and nickel-plated columns, are displayed mostly on terraced shelving at the rear of the space The columns displayed range in capacity from 6″ variation to 60″ variation between the high and low water alarms, and are a genuine surprise in point of both beauty and capacity even to many mechanical and steam engineers who are supposed to be familiar with such appliances. Beside the columns displayed at the rear there are also displayed on nickel-plated stands, polished brass and nickel-plated columns, such as have been adopted by the U. S government, and four sectional models of aluminum showing the construction of the various columns displayed. There is also displayed among the columns a surprisingly large and varied assortment of the Reliance Solderless Floats, manufactured by this company, and used not only in the Reliance Safety Water Columns, but in all kind of high pressure steam engineering. Excellent taste is displayed in the exhibit throughout. The exhibit was designed and installed by Mr. A. J. Wright, president of the company, and is in charge of Mr. Geo. B. Clark, a most affable and competent lieutenant, who is known to the electrical people in many parts of the country, particularly in New England, where his time has been mostly spent during the past year.

CHICAGO INTERESTS.

The Midland Electric Works, 108 Fifth avenue, manufactures electrical apparatus of all kinds, and makes experimental and repair work a specialty.

The National Electric Manufacturing Company, of Eau Claire, Wis , is represented in Chicago by that popular gentleman, Mr. C. A. Daigh. Mr. Daigh's offices are in the Pullman Building.

Edward Lasell, 225 Dearborn street, carries a large line of magnetos, bells, messenger-call boxes, etc. He is also general Western agent for the Viaduct Manufacturing Company, of Baltimore, Md.

The Garden City Fan Co. is said to be the largest manufacturers of fans and blowers in the West. It makes fans and blowers of all kinds and there is nothing in the fan line that it is not "into."

The Allen-Hussey Company, 225 Dearborn street, manufactures a line of incandescent specialties etc. The company carries on a general electrical manufacturing and contracting trade. It has an extensive factory at 24 Custom House Place.

Mr. F. D. Rusling, Room 206, 225 Dearborn Street, is general agent for everything electrical, including dynamos, motors, elevators, railways, arc lamps, fans, storage batteries, and supplies of all kinds. He makes a specialty of complete installation of electric light plants.

Elektron Manufacturing Co., of Springfield, Mass., Chicago office 435 the Rookery, C. F. Dunderdale, agent; Kerite wires and cables, Cushing and Morse, Chicago agents; the General Incandescent Arc Light Company, of New York city, L. E. Frorup, 175 Adams street, Chicago, manager.

Edward C. Mandeville, Chicago manager of the C. & C. Electric Motor Company, of New York, has a fine place at 201 East Madison Street. He keeps a very large stock of his company's celebrated dynamos and motors on hand and does a very large trade. These machines are regarded with much favor in the West.

Mr. C. V. Osborn, 110 Franklin Street, has made quite a reputation in the manufacture of electrical apparatus. He makes static machines, physicians', family and cabinet batteries, electrodes and rheostats, also dynamos, motors, and philosophical apparatus for schools. He also does general construction and light metal work.

Mr. A. W. Storms represents the Hanson & Van Winkle Co., of Newark, N. J., the well-known manufacturer and dealer in platers' supplies, polishers' supplies, dynamos, lacquers, etc. Mr. Storms has several sizes of plating dynamos, also a full line of polishing brushes, buffers and tools. His headquarters are at 35 and 37 Canal Street.

McLean & Schmitt, Warren Springer Building, 197 S. Canal Street, carry on an extensive trade as electrical contractors. They do electrical repairing of all kinds in a first-class manner, and handle supplies for the Excelsior system of lighting. This firm is the successor of the Excelsior Electric Co., and is composed of James McLean and P. H. Schmitt.

The Chicago Electric Motor Co., 313 South Canal street, has established a reputation for its electrical repair work. It makes a specialty of rewinding motor and generator armatures, and handles a large line of fan motors wound for incandescent, arc and storage battery circuits; also dental 3-speed reversible foot switches.

G. E. Horn & Co., 63 South Canal street, are extensive manufacturers and jobbers of electric bells. Their bells are more sensitive and require less battery than any bell in the market, it is said. Only one magnet is used, and the quality of the materials and class of workmanship are said to be unsurpassed. The bell is extremely simple in construction and there is absolutely nothing to get out of order.

The Enterprise Electric Co., 313 & 315 Dearborn Street, Chicago, is the western agent of the National India Rubber Co. of Bristol, R. I. This company's wires and cables are thoroughly known in the trade, and are used for all electrical purposes. The rubber insulation is seamless, and rubber insulated wire made by this company eighteen years ago is perfectly good today. Only the purest lake copper and fine Para rubber are used in the manufacture of these cables.

Among the foremost electrical concerns having agencies in the World's Fair City are the Bryant Electric Company, of Bridgeport, Conn.; the Brush Electric Company; the Eddy Manufacturing Company, of Windsor, Conn.; the C. & C. Motor Co., of New York city; the New York Insulated Wire Company, New York city; the Electric Construction and Supply Company, maker of "Ward" arc lamps, New York city; the General Electric Company, at 172 Adams street; the W. C. Vosburgh Manufacturing Company, gas and combination fixtures and electroliers, Brooklyn, N. Y., Chicago office 184 and 186 Wabash avenue.

Wilson & Jackson, Times Building, Chicago, are gentlemen well known in the electrical trade. Mr. Charles H. Wilson was for a long time superintendent of the Chicago Telephone Company. He was formerly assistant electrician for the Western Union Telegraph Company, and later held the position of General Superintendent of the Central Union Telephone Company. Mr. George W. Jackson, the other member of the firm, is a prominent and well-known contractor of Chicago. The firm of Wilson & Jackson does a general electrical contracting business in the line of electric railway construction, telephone, telegraph, aerial and underground work, etc.

The Columbia Electric Company, 115 Franklin street, is the successor of the Chicago Incandescent Wiring Company. The change in the name was made to avoid the old long title, which was too lengthy for business men. Another reason for the change was to indicate more accurately the scope of the business, the old title being too limited in its meaning. The Columbia Company has added to its business a large line of electrical and household specialties, and it will make a specialty of Ideal annunciators and supply them in any number. The Ideal annunciator is said to be the only instrument having a reliable automatic set back, and it requires no attention. The last call displaces any indication of all previous calls, and should two calls be made from different points simultaneously, both indicators will appear.

The Chas. E. Gregory Co., 47 and 49 South Jefferson street, is a live concern in this live city. It buys, sells and barters dynamos that have seen some service, and keeps on hand reliable dynamos for all purposes, arc lamps for all systems and a complete line of desirable arc specialties. All apparatus is thoroughly repaired, tested and adjusted before being put out of the factory. Among the arc lighting specialties dealt in by this company may be mentioned the Pfluger arc lamp, the Pfluger acorn double pole arc switch, the Pfluger wire tightening ceiling board, the Pfluger automatic arc lamp hanger and cut-out, Parmly carbon holders, Pfluger arc lamp hanger, arc ceiling boards with single switch, arc ampère meters, perfect protection lightning arresters, and arc switch boards. Mr. Charles E. Gregory, the president of the company, is well known among electrical people, and is a gentleman well qualified to be at the head of an enterprising concern of this character.

The Electric Appliance Company, 242 Madison street, is an old establishment in the electrical trade. To enumerate the different classes of goods this company handles would fill a good sized volume; indeed its catalogue is one of ample dimensions, and its trade is correspondingly large. Its Paranite wires and cables are celebrated the world over. These cables are for aerial and underground purposes, and give general satisfaction. The company is the general Western agent for Canvas Jacket weather-proof wire, and flexible interior conduits. Among the specialties handled by the Electric Appliance Company are "O.K." Weather proof line wire, Packard incandescent lamps, Turbayne incandescent arc lamps, Meston alternating current fan motors, Elkhart transformers, swinging ball lighting arresters, New England double pole switches, security insulators, Davis arc light cut-outs, Whitney electrical instruments, Acme expanding wire guards, C. E. M. jack-knife switches, Acme automatic electrolier, Schuttles Ratchet track drills, Mica Ashetite railway appliances, Acme electric door opener, etc.

The Charles Munson Belting Company, 22–36 South Canal street, Chicago, is known very well in the electrical trade. Its leather belting is extensively used in electric light and power stations, and that it gives universal satisfaction is a matter of general knowledge. The company has been over 25 years in the business and having survived so long a period it is evident that it is a reliable house. From a small beginning it now claims to have the largest and most complete belt factory in the United States. Its trade is not confined to the United States, but is rapidly extending in foreign countries. Persistence and enterprise characterize this concern, which is the secret of its success. Its products are of the highest standard of excellence. The stretch from each individual piece of leather is removed, the elasticity remaining, which is essential for its life and durability. The company carries in stock a full line of regular sizes of belting up to and including 40 inch double: larger belts and irregular sizes are produced on short notice. The company's manufacturing facilities are said to be unequalled; it has 5 hand presses and 24 hydraulics, the latter running from 30 to 74 inches in width, and from 60 to 250 tons pressure.

Branch offices are maintained in New York, Pittsburg, Philadelphia and New Orleans. Besides the branches, the company has agencies in many of the larger cities throughout the country. The officers of the Charles Munson Belting Company are: Charles Munson, president; Adolph Groetzinger, vice president; E. A. Groetzinger, secretary; B. F. Horsting, treasurer; J. H. Shay, electrician; Jacob Barnsley, superintendent of manufacturing.

NOTABLE ISSUE.

The January (1893) issue of *Electrical Plant*, of London, is a remarkable one. It is devoted to marine electric lighting, and it contains completely illustrated articles on electric lighting on ships of war, vessels of the mercantile marine, yachts, lighthouses, harbors and docks. The number is very voluminous, and will always be valuable as a work of reference.

VICTOR KEY USED AT THE OPENING OF THE FAIR.

A distinctive feature in the opening of the Exposition was the closing of the initial electrical circuit by President Cleveland by means of a solid gold Victor telegraph key, mounted upon a royal dias of three steps, the risers of which were covered with the orange and yellow, national colors of Spain, and the steps themselves with American blue in plush and velvet, out of compliment to the principal nationalities in the event.

The Victor Telegraph Key was made by the regular manufacturers of this device, The E. S. Greeley & Co., of New York, and is a fine piece of workmanship, being mounted, instead of the ordinary rubber knobs, with rich ivory fittings. The dias was suitably inscribed in silver with the century dates 1492 and 1893.

It is stated that the device, after use, is to be either stored in some prominent museum or presented to President Cleveland as a souvenir of the occasion.

ELECTRIC AND STEAM LAUNCHES WANTED IN CHINA.

On April 22, 1893, the Department of State received from Consul Fowler, at Ningpo, China, the following communication, which is of great interest to manufacturers of steam, oil, or electric launches.

In a recent interview with the Taotai of this Circuit I pointed out to him the great advantage in the saving of time and comfort that would accrue if he adopted the modern method of travelling by the use of a steam, oil or electric launch in his journeys about this district. I explained, to the best of my ability, the workings of the various kinds of launches, and he seemed so pleased with the idea of being able to travel with greater comfort and more speed than is now the case that he requested me to write to the United States for particulars; therefore, I have the honor to request that the Department will kindly place this before the manufacturers of launches, in order that they may tender diagrams, cuts, etc., so that I can have the matter placed before his excellency, thus enabling him to select such launch or engine as seems most suitable for these waters. It must be remembered that this vast district is intersected by thousands of miles of canals and rivers; and, although it covers a territory of 39,500 square miles and has a population of from 25,000,000 to 35,000 000 people, there is not a single launch or boat of any kind propelled by steam, oil, or electricity, excepting a few launches that ply from Shanghai to Hangchow, the capital, 150 miles northeast of this port.

The Taotai has occasion to go to the capital frequently. He travels in a small covered boat propelled by "ya lows" (large oars), worked similarly as a whale boat is worked, *i. e.*, by sculling. The average distance travelled in a day is 100 lis, or thirty-three and one third miles.

A boat suitable for China would have to be built very strong, the propeller be so arranged that it could be taken up or protected in some way from the ropes that are passed around the stern of the boat while it is being pulled over the "haul over" from a river to a canal, or from a lower to a higher canal A "haul over" (over part of the bank, sloped for the purpose by masonry or earth work and covered with wet and slippery clay) forms a sluiceway. A boat to pass from a river to a canal has a rope passed around the stern, the ends of the rope being wound around a windlass on each side of the sluice. Men work the windlass on both sides until the boat has been hauled to the ridge, when it is pushed into the water. There are no locks. Sometimes a boat is dragged across a "haul over" by water buffaloes or oxen, but the first method is the common one hereabouts.

Another consideration is, that in some places the canals are only wide enough for a boat of the regulation size ; this is especially so between the supports or arches of bridges. Finally, the bridges are so low that it is of the greatest importance that the roof of the cabin or cover should not be so high as to prevent the boat from passing under them.

The boats for travelling are called house boats. Foreign boats use a hull built native fashion, and in or on this hull is erected a small house, fitted with windows, berths, closets, etc. They are quite comfortable, and one can travel for weeks : in fact, it is the only way one can travel in this part of China. The boats used by the natives are not so comfortable, yet are often more expensive.

If it is possible for manufacturers to build an engine that can be placed in the boats used here, I think that there would soon be a large demand for such engines. The canals are the only roads, and all travel is, of course, by boat. The traffic carried on by boats is very large. The introduction of quicker methods of travel would be highly appreciated, especially if the Taotai sets the example, and I deem this a most auspicious time to introduce our methods into this province.

Some years ago I saw in Washington a boat which I think would be especially well adapted for China. If I recollect aright, it was a petroleum launch made in Providence, R. I., by Brayton (?); but such rapid strides have been made since then that possibly there may be more suitable kinds on the market now.

For the guidance of interested parties the following description may be of some use: Length, 38 feet; breadth, 6 feet 10 inches; height from keel to rail, 3 feet; height from rail to top of house, 2 feet 9 inches.

A flat-bottom boat is, of course preferable, and one that follows the Chinese style. It has occurred to me that it may be possible that a boat could be built with a top or house, having the sides arranged in such a manner that it could be telescoped or lowered ; in that case the roof could be higher than in a stationary one. One without a smokestack or with a smokestack that is easily lowered would be popular; in any case the stack must be a very short or low one. It would be well for the manufacturers to include in their estimates the cost of delivering the same by steamer or sailing vessel at Shanghai or Hongkong.

I have been discussing the benefits of small launches with the Taotai for the past two years, and now he has requested me to find out all I can for him. If he should adopt a launch for his own use, I am quite confident that it will not be long before many orders will be placed with our manufacturers. There is a splendid opening here. An immense traffic is carried on in boats, which now depends on the tide and the endurance of the "yu loese" (scullers). A company has been organized at Swatow of Chinese, who run a steam ferry (launches) a short distance upriver, and I understand they are doing a very lucrative business.

John Fowler, Consul.

United States Consulate,
Ningpo, March 10, 1893.

STARTING THE BIG ALLIS ENGINE.

On April 25 the 2,000 H. P. Allis Engine at the World's Fair was put into operation for the first time on a test. It's fly wheel measures thirty feet in diameter, with a face of seventy-six inches, and weighs seventy-five tons. The shaft is twenty-six inches in diameter and seventeen feet over all. The whole shaft is placed on a tower and weighs thirty-five tons. The engine is a quadruple expansion, working under a steam pressure of 115 pounds, and performs sixty revolutions a minute.

AN EARLY DYNAMO.

BY TOWNSEND WOLCOTT.

(*Continued from page 260.*)

On April 3d, 1867, there was filed in the New York County Clerk's Office, the following certificate :

CERTIFICATE FILED IN NEW YORK COUNTY CLERK'S OFFICE,
APRIL 3RD, 1867.

American Electric Light Co.

Was organized March 7th, 1867, by Henry O'Reilly, Charles A. Seeley, Lorenzo Sherwood and John W. Orr, for the manufacture, purchase and sale of machinery, material and apparatus for generating electricity for producing electric light for illuminating cities and edifices of all kinds, on land and sea—Capital Stock $300,000—Duration of Company fifty years.

Names of trustees (of whom there are seven) for the first year are Henry O'Reilly, Charles A. Seeley, Lorenzo Sherwood, John W. Orr, Horace Greeley, A. E. Beach and J. Dwight Porter. The principal places of business are at New York city, Brooklyn and Rochester, N. Y.

The certificate of incorporation was executed by H. O'Reilly, C. A. Seeley and John W. Orr, April 2d, 1867, and sworn to before Gardiner Spring, Jr., Notary Public.

Of the gentlemen named in this certificate Mr. A. E. Beach is alone living. Professor Seeley told me some years ago that Mr. Greeley had an idea of making the organization serve to some extent the same purpose as this society ; that is, the advancement of electrical science.

Mr. Beach's recollection of the company is that it was intended to secure electrical inventions as fast as they made their appearance; in fact to build up a large organization on the plan of some of our modern companies. Mr. Beach published in the *Scientific American* of April 20, 1867, an article entitled "Electric Light, Wilde's Magneto Electric Machine."

[From the *Scientific American*, April 20, 1867, p. 248.]

ELECTRIC LIGHT—WILDE'S MAGNETIC ELECTRIC MACHINE.

The subject of electric light is now attracting more attention than at any former period. Every day we find something about it in our foreign and domestic exchanges. Three of the city newspapers within a few weeks have printed full column editorials under the title of Electric Light. The lighthouse directors of England, France and America, simultaneously but independently, are instituting experiments on a liberal scale to determine if the electric light may not be the best for lighthouses. And as a natural consequence of these movements a business association under the style "The American Electric Light Co.," has been chartered and will be soon in active operation. This new interest in electric light was originated by the exhibition in England of the machine which is described in this article. No wonder, for the light from it is the most powerful artificial light ever produced. Mr. Crookes testifies that when he saw it, it had three or four times the power of the sunlight. The machines first built were found too powerful for lighthouse illumination, and it was found advisable to make machines for that purpose of only one-half the original sizes.

Professor Seeley had never seen a self-exciting dynamo, but had kept well abreast of the European work on the subject, so far as possible by reading, and was also familiar with the arc of Davy and the incandescent carbon of Starr. The machine built by him is before you, and you can see that the design is not bad, considering the date of manufacture. It passed through a fire in Professor Seeley's offices at 26 Pine street, early in December, 1874, and was rewound with the same field wire with new insulation and new armature wire as nearly like the original as possible.

Mr. Wm. H. Burnap, of 259 West Twenty-seventh street, who made the repairs, confirms Professor Seeley's recollection as to these points. Professor Moses G. Farmer saw the machine when it was comparatively new, but the exact date I have not been able to ascertain. Professor Farmer estimated the capacity of the machine as about two or three telegraph cells, meaning Grove cells. This estimate is evidently too low, if the machine be run at a reasonable speed, but the machine was originally turned by hand power, and the estimate was probably about right. The necessity of a high speed to secure a reasonable output was not so well understood when the machine was built as it is now. Mr. Weston saw the machine in the summer of 1882.

Dr. Van der Weyde remembers the machine well and is quite certain that it was built before the company was organized, which confirmed what has already been said, but cannot fix the date any more accurately. Dr. Van der Weyde also says that he remembers when the machine was first started that there was some difficulty in getting it to excite owing to the field not being connected in the proper relation to the direction of armature winding and rotation. That is, the machine instead of exciting itself, demagnetized itself until the connections were reversed. This was quite a common error a long time after.

AN UNUSUAL OCCURRENCE.

A communication has been received from the Watertown Street Railway Company, describing an experiment recently made on its line. The company has two independent railroad lines. Each line is connected to a 100 K. W. Edison generator. The machines are run from separate power plants. The dynamos were thrown in multiple on the entire system, when one machine was generating 400 volts and the other 500 volts. The belts would slip for an instant on throwing in, but the dynamos would then equalize and run together perfectly.

[Dynamos of similar voltage are thrown in multiple on light and power systems every day. It is considered necessary to bring the machines to the same voltage before throwing in. From the account given it seems that one dynamo was underloaded while the other was overloaded. The machine giving 400 volts had a large current in its armature; thus, a comparatively large drop in voltage internally, due to the product of the resistance of the armature (R) by the current (C). The machine giving 500 volts was running light with a small amount of current in its armature; thus, internal drop of voltage was small. On throwing in multiple, the instantaneous movement to run the dynamo giving 400 volts as a motor, was checked by the increase of curent in the 500 volt machine; thus increasing the lost volts in its armature and bringing down the voltage of the machine, while the load being partly taken off the 400 volt machine, the current was decreased, thereby decreasing the lost volts in its armature and increasing the terminal voltage; this, with the field regulation, established a common and intermediate voltage for both machines. Hence the machines ran smoothly together. Other suggestions on this subject will be cordially received.—*Ed. Elec. Age.*]

A wealthy ranch owner in Paradise Valley, near San Diego, Cal., proposes to try the experiment of growing oranges and lemons by aid of electric light. He will place electric arc lights among the trees to try the efficacy of the light in developing the fruit.

ELECTRIC WIREMEN IN CHICAGO.

A despatch from Chicago on April 28, states that a strike among electrical workers is imminent.

The electrical contractors met at the Grand Pacific Hotel on April 27 and formed an association. Rules were adopted which go into effect Monday, May 1, guaranteeing a minimum rate of wages of 37½ cents to "first-class" wiremen. They make no provisions with regard to the employment of union men, and ignore any question of entering into an agreement on this or any other matter upon which the Union desires an agreement. Each representative of the Union present says that a strike is inevitable, and that involving, as it will, members of every Union in the building trade, it will be one of the largest which the city has seen.

The members of the Contractors' Association declare they are ready to fight the Union.

APPOINTMENT.

L. H. Rogers, who is well known in electrical circles, has recently been appointed assistant general manager of the Brush Electric Company, of Cleveland, Ohio. Mr. Rogers was for some years associated with S. M. Hamill, general manager of the Brush Electric Company, in the Eastern States. During the past two years he has been the representative of the General Electric Company for the states of Maine and New Hampshire. Prior to his connection with the Brush Company, he represented the Electrical Accumulator Company in New York, under the presidency of Theodore N. Vail. Mr. Rogers has had a long and wide experience in the electrical business. He is a very conscientious and reliable worker and has the happy faculty of making friends with those with whom he comes in contact.

NOTES OF GENERAL INTEREST.

The Committee on Public Lighting of the City Council, Detroit, Mich., has reported in favor of a municipal plant for that city.

The Chicago Edison Company and the Chicago Arc Light and Power Co. have taken legal action to confirm the consolidation of the two companies. The new company will be known hereafter as the Chicago Edison Company. Mr. C. H. Wilmerding has been appointed manager.

Gov. Flower has signed the bill authorizing village trustees to expend fifty cents per capita, per annum, of the village population for lighting streets.

The Salisbury, Md. electric light plant was destroyed by fire April 22.

The capital stock of the Toledo Electric Light Company, Toledo, Ohio, is to be increased from $200,000 to $500,000.

Catalogue.—We are in receipt of a copy of the finely illustrated catalogue of the F. P. Little Electrical Construction and Supply Co. of Buffalo, N. Y. The first part of this book contains much valuable information for steam and electrical engineers, firemen, and in fact for all persons brought into connection with electrical machinery. Among subjects touched upon are care and use of dynamos and boilers, electrical units and formulæ, handy wire tables and a table of squares. A book containing this kind of information is one that it is well for all engineers and central station men to have close at hand. The rest of the catalogue is devoted to illustrations and price lists of the company's large and varied stock of electrical appliances.

TRADE NOTES.

Lord's Boiler Compound is in use by over 3,000 steam users in North America. Send for sample to Geo. W. Lord, 316 Union street, Philadelphia.

The Granite State Electrical Company, Concord, N. H., manufacturer of Cushman motors and dynamos, has moved into larger quarters to accommodate its increasing business.

J. L. Hays & Co., 830 Liberty avenue, Pittsburgh, Pa., is doing a large trade in tablet boards, cut-outs, etc. They also do electrical repair and shop work; rewind armatures, refill commutators, etc., and have a reputation for first-class and honest work.

The new machine shop for the Eastern Forge Co., of Portland, Me., will be designed and built by the Berlin Iron Bridge Co, of East Berlin, Conn. The building will be 57 feet in width and 150 feet in length, and will be entirely of brick and iron, with all modern improvements.

The Electrical Age's Illustrated Record of Patents.

Issued April 25, 1893.

495,989. Method of Welding Metal. Arthur J. Moxham, Johnstown, Pa. Filed June 16, 1892.

495,996. Closed-Conduit Electric Railway. William P. Patton, New York, N. Y. Filed July 15, 1892.

496,017. Rack-Rail for Railroads. Max M. Suppes, Johnstown, Pa., assignor to the Johnson Company, same place. Filed May 26, 1890.

496,019. Electric Soldering. Elihu Thomson, Lynn Mass, assignor to the Thomson Electric Welding Company, of Maine. Filed Jan. 22, 1889.

496,020. System of Electric Distribution. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Dec. 29, 1890.

496,041. Electro-Mechanical Block-Signaling Apparatus. Murray Corrington, New York, N. Y. Filed April 26, 1892.

496,060. Electrical Stop-Motion for Knitting-Machines. George J. Manderfield, Royersford, Pa., assignor of one-half to J. M. Lewin, Samuel Lewin, U. S. G. Finkbiner and A. R. Saylor, same place. Filed Nov. 25, 1892.

496,067. Electric Alarm for Tanks. Frederick C. Skelton, Montreal, Canada. Filed Oct. 4, 1892. Patented in Canada, Aug. 8, 1892.

496,081. Insulator. Joseph F. Wright, Colorado Springs, Colo. Filed Jan. 31, 1893.

496,103. Electric Cigar-Lighter. Lawrence T. Smith, Barrington, R. I. Filed Oct. 24, 1892.

496,104. Lineman's Wire-Grip. Claes A. Svensson, Buffalo, N. Y. Filed Oct. 28, 1892.

496,126. Storage-Battery. Frederick A. La Roche, Philadelphia, Pa. Filed March 25, 1892.

496,135. Electric Synchronizer for Clocks. Henry S. Prentiss, Elizabeth, N. J. Filed June 22, 1892.

496,137. Mechanical Telephone. George H. E. Ricke, Cincinnati, Ohio, assignor of one-half to John A. Ringold, same place. Filed Apr. 15, 1891.

496,176. Method of Electroplating Aluminium and its Alloys. George Wegner and Paul Gührs, Berlin, Germany. Filed Feb. 3, 1893.

496,191. Phonograph. Thomas A. Edison, Llewellyn Park, N. J. Filed Feb. 9, 1891.

496,192. Annunciator. John H. Elfering, Milford, Conn. Filed Oct. 3, 1892.

496,207. Electric Reporter. Major D. Porter, Brooklyn, N. Y., assignor, by mesne assignments, to the National Electrical Manufacturing Company, of New Jersey. Filed Nov. 27, 1886.

496,212. Electric Converter. William Stanley, Jr., Great Barrington, Mass., assignor, by mesne assignments, to the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. Original application filed Oct. 1, 1887. Divided and this application filed Apr. 1, 1889.

THE
"CLARK" WIRE.

TRADE MARK.
"CLARK" WIRE.

Insulation Guaranteed wherever used, Aerial, Underground or Submarine.

In a letter from the Inspector of the Boston Fire Underwriters' Union, he says:

"A thoroughly reliable and desirable Wire in every respect."

The rubber used in insulating our wires and cables is especially chemically prepared, and is guaranteed to be waterproof, and will not deteriorate, oxidize or crack, and will remain flexible in extreme cold weather, and is not affected by heat. The insulation is protected from mechanical injury by one or more braids, and the whole slicked with Clark's Patent Compound, and special extra finish, which we have now adopted for all our solid wires as an extra weatherproof protection, and also preventing chafing and abrasion, which is water, acid, and to a very great extent fireproof. Our insulation will prove durable when all others fail. We are prepared to furnish Single Wires of all guages and diameter of insulation for Telegraph and Electric Lights from stock. Cables made to order. We are now prepared to furnish our Clark Wire with a white outside finish for ceiling cleat work as well as our standard color.

Clark Joint Gum should be used for making waterproof joints. This is put up in half-pound boxes, in strips about one foot long and five-eighths inch wide, and when wrapped about a joint and pressed firmly it makes a solid mass. **FOR RAILWAY** and **MOTOR** use we make all sizes of stranded and flexible cables with Clark insulation.

WE GUARANTEE OUR INSULATION WHEREVER USED. AERIAL, UNDERGROUND OR SUBMARINE, and our net prices are as low, if not lower than any other first-class Insulated Wire. We shall be pleased to mail Catalogues with terms and discounts for quantities.

TRADE MARK.
"CLARK" WIRE.

EASTERN ELECTRIC CABLE CO.,
61 to 65 Hampshire Street, Boston, Mass.
HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician.

PATENTS.—Continued.

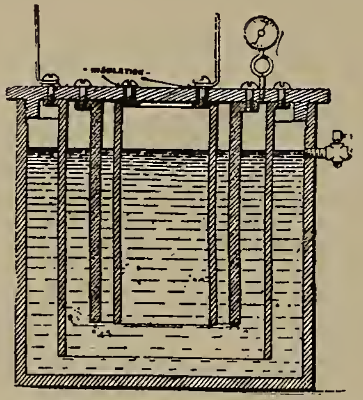
496,224. Diaphragm-Holder for Telephones. Silas W. Holman, Boston, Mass. Filed Nov. 5, 1892.

496,228. Dry Battery. Hugo Koller, Vienna, Austria-Hungary. Filed June 21, 1892.

496,244. Electro-Galvanic Adhesive Plaster. Frederick A. Barret, St. Louis, Mo., assignor of one-fourth to Jacob Lippe. Filed Sept. 28, 1892.

496,258. Electric Program-Clock. Henry C. Hain, Booneville, Mo. Filed April 18, 1892.

496,280. Electric Railway Trolley. Wesley W. Pritchett, Ogden, Utah. Filed Nov. 2, 1892.



496,126—STORAGE BATTERY.

496,307. Combined Dynamo-Electric Machine and Water-Motor. John O. Heinze, Jr., Lynn, Mass., assignor to the Heinze Electric Company, same place. Filed Oct. 15, 1892.

496,308. Cut-Out and Circuit-Protector. John O. Heinze, Jr., Lynn, Mass., assignor to the Heinze Electric Company, same place. Filed Oct. 15, 1892.

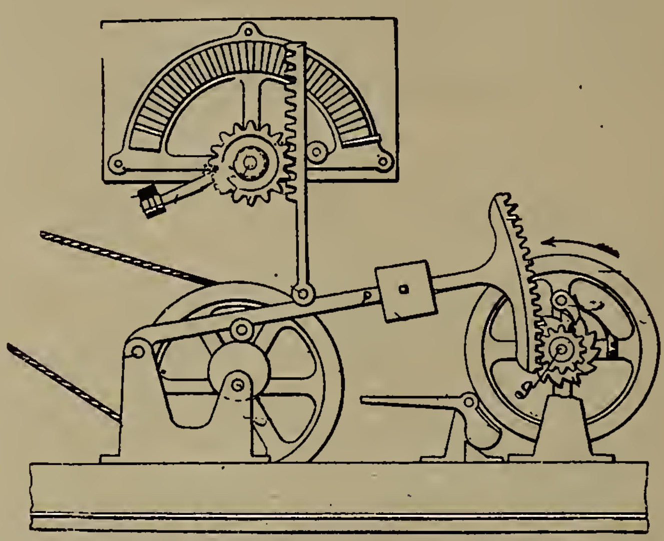
496,309. Volt and Ampere Meter. John O. Heinze, Jr., Lynn, Mass., assignor to the Heinze Electric Company, same place. Filed Oct. 17. 1892.

496,312. Electric Measuring-Instrument. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Nov. 16, 1892.

496,330. Electric Locomotive. Charles J. Van Depoele, Lynn, Mass.; C. A. Coffin and Albert Wahl, administrators of said Van Depoele, deceased, assignors to the Thomson-Houston Electric Company, Boston, Mass. Filed Sept. 24, 1891.

496,331. Electro-Magnetic Reciprocating Pump. Charles J. Van Depoele, Lynn, Mass.; C. A. Coffin and Albert Wahl, administrators of said Van Depoele, deceased, assignors to the Thomson-Houston Electric Company, Boston, Mass. Filed Dec. 12, 1891.

496,366. Electric-Light Display System. Daniel McF. Moore and Charles M. Jacobs, New York, N. Y. Filed Nov. 22, 1892.



496,382—CONTROLLING DEVICE FOR ELECTRIC ELEVATOR.

496,371. Electric Meter. Francis Teague, London, England, assignor by mesne assignments, to Joseph Sinclair Fairfax and Jasper Wetter, same place. Filed Feb. 2, 1892. Patented in England Nov. 5, 1891; in France, Jan. 7, 1892; in Belgium, Jan. 13, 1892, and in Italy, Mar. 31, 1892.

496,381. Cable-Rack. Albert C. Gray, Pittsburg, Pa., assignor to the Western Electric Company, Chicago, Ill. Filed Oct. 22, 1888.

496,382. Controlling Device for Electric Elevators. Charles E. Moore, Boston, Mass. Filed June 21, 1892.

VULCANIZED FIBRE COMPANY,
Established 1873.
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ELECTRICAL AGE

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NEW YORK, MAY 13, 1893.

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NAVAL ELECTRICAL DISPLAY.

The English ships of war now lying in New York harbor were, on the night of May 5, beautifully illuminated by electric lights. A vast crowd on boats and on shore witnessed the event, the like of which had never been seen in this vicinity before. The hulls of the ships their funnels, and masts were outlined with incandescent lights and the effect was strikingly beautiful.

THE RAPID TRANSIT PROBLEM IN NEW YORK CITY.

The Manhattan Railway Company has replied to the propositions made by the Rapid Transit Commission for the extension of the elevated railroad system. The commission recommended that the railway company extend its tracks to the nothern line of the city, build a loop along West street, lay four and three tracks along portions of its road, and pay the city five per cent. of its net receipts. The railway company is not willing to acquiesce in all the propositions. It demurs at paying the city five per cent. but is willing to pay three, and it does not want to extend its lines beyond Fort George. Rapid Transit in New York city is a very difficult problem to solve.

WESTINGHOUSE VS. GENERAL ELECTRIC.

The bitter rivalry that exists between the General Electric Company and the Westinghouse Company is every now and then publicly manifested in one form or another. The latest outbreak is contained in a press despatch from Pittsburg, Pa., on May 5, in which it is stated that the Westinghouse Company has sued its opponent for larceny. The story is to the effect that the General Electric Company through bribery and corruption of certain employès of the Westinghouse Electrical and Manufacturing Company obtained possession of some of the latter company's tracings, blue prints, drawings, specifications, letters, proposals and other confidential information relating to plans for the transmission of power from Niagara Falls by electricity. The two companies submitted plans for the power plant at Niagara Falls. Shortly afterwards the General Electric Company, it is alleged, withdrew its original plans and submitted new ones which resembled the Westinghouse plans so strongly as to warrant the belief on the part of the Westinghouse people that they had been obtained in the manner indicated; hence the suit.

"DYNAMOTOR."

The word "Dynamotor" is the latest addition to the electrical vocabulary. It is intended to signify a direct current transformer, and was used for the first time, as far as we know, by Prof. F. B. Crocker at the meeting of the New York Electrical Society last Friday night. The term, he said, had been suggested, but he did not think it was altogether appropriate, although it was, in some points, a good word. In the combination the motor necessarily occupies the first place, and the dynamo next, but the word "Dynamotor" implied the reverse. The professor's point is a good one, but if the electrical engineers are agreed to sacrifice a little etymological accuracy for the sake of euphony and brevity, the use of the word will probably receive general sanction.

ELECTRIC HAULAGE IN COAL MINES.

The problem of economic haulage in mines has lately received considerable attention from mine owners, who have found the expense involved in haulage alone much greater than in their opinion it should be. The mule has had his day as the principal factor in the haulage question, and the cable is under test, with results more or less satisfactory. The electric locomotive for mine work is comparatively a new-comer in the haulage field, but it has already acquired considerable prestige and bids fair to supersede both the mule and rope haulage.

An excellent example of the work done by the electric locomotive in coal mining is shown at the Rock Springs Coal Mine, at Rock Springs, Wyo. This plant was installed by the Mining Department of the Northwest General Electric Company.

About a mile from the mouth of the mine the power station, containing a dynamo of 80 H. P. driven by a steam engine, is located. Current from this is delivered at a pressure of 550 volts, which allows of a drop of about 10% between the power house and the mine.

The feed or supply wire is No. 000 hard drawn bare copper, making a complete metallic circuit. The trolley line is furnished with a circuit breaker about 30 feet from the mine mouth, so that the current may be cut off from the mine when the locomotive is employed for switching purposes outside.

The locomotive used is of the G. L. M. General Electric Company type, of 30″ gauge, 60 H.P., recently described in our columns. Its usual speed in this instance is about eight miles an hour. The cars used are of the ordinary coal mine type, weighing each, when filled, about 3,000 lbs.; when empty, about 1,000 lbs.

The economy attained by the use of this locomotive is strikingly illustrated by the fact that by its aid 30 cars were run from the loading point to the end of the track, a distance of about 6,000 feet, there dumped and returned to the mine in 20 minutes. On another occasion the locomotive drew after it 30 loaded cars, and pushed ahead 16 others from end to end of the road without difficulty. The track is built of 35 lb. T-rail and has several switches and spurs necessary to the rapid handling of the cars.

It is not inappropriate here to quote from a letter from the expert, giving an account of the contact with the bare wire and the results thereof:

"Several men have been shocked since our plant began operating, but the effect is only momentary, and they only laugh at it. The result has simply been to remove all fear they had of it. As I stated in my letter, this is a very dry mine, and so the only way one can get shocked is to stand on a rail and the touch wire. I have been shocked several times myself while handling the locomotive, through thoughtlessness. The other day a balky mule ran right into the wire with his head. He was knocked down. He got up and ran into it again three times and was dropped in every instance. After that he simply turned around and walked off to his work. I ought to remark that the shock does not knock a man down or burn him. The only description I can give of its effect from personal experience is a tingling sensation, lasting, in the heaviest shock I received, not more than one or two minutes afterwards in the hand that made contact."

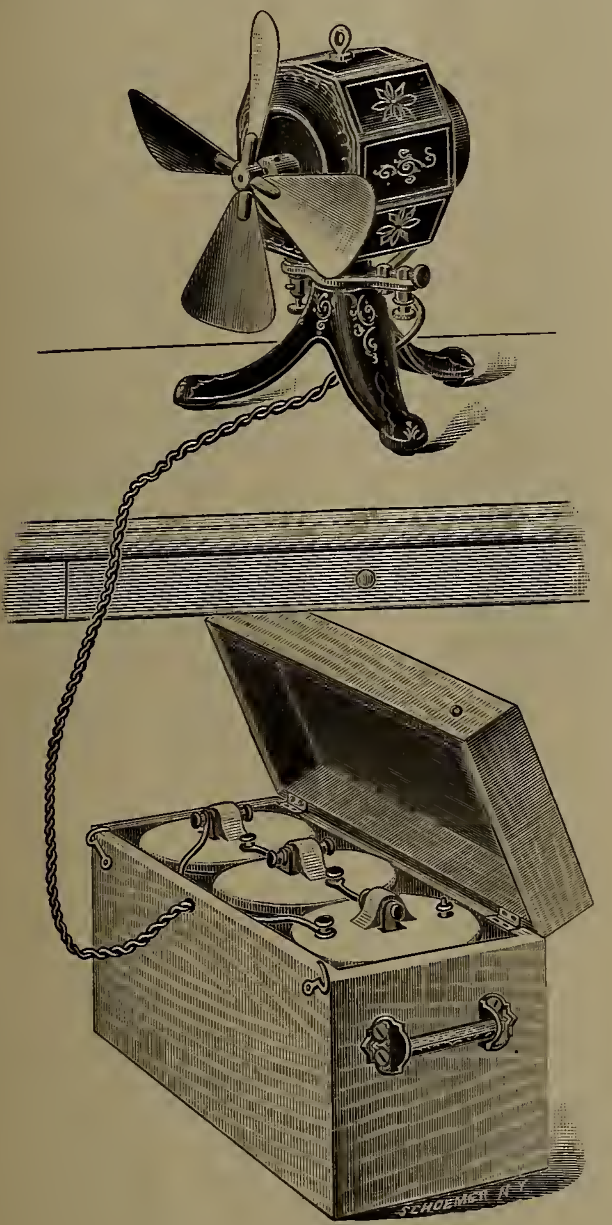
ELECTRIC COAL MINE HAULAGE AT ROCK SPRINGS, WYO.

This last is a fact which should reassure mine owners who have any fears of danger from contact with the trolley wire. The element of danger once recognized as entirely absent, the electric locomotive can compete on equal grounds with any other system of haulage, with many points in its favor which cannot be urged by its competitors. We expect to see its adoption become general, both on account of the economy of its operation as well as its convenience of manipulation.

Herr Krupp will test the explosive power of coal dust for the purpose of driving engines.

NEW IRON-CLAD BATTERY FAN MOTOR.

This fan motor has been designed with especial reference to primary battery operation. The friction of its armature bearings and brushes has been reduced as far as practicable, and it runs a 7'' four-bladed fan at 1,000 evolutions per minute, with 2.0 amperes and 1.5 volts at the terminals. This gives an almost noiseless delivery of steady breeze for table or desk use, and its presence will be very welcome during the approaching warm weather. The battery consists of three Edison-Lalande Q cells in an oaken box. The capacity of one charge in this battery is 150 ampere-hours, with practically no loss from local action when the motor is out of use. By this means, the battery will last ten weeks without renewal at one hour's work daily, or ten days at a steady operation of 7½ hours per diem. For the parlor or dining table the fan is an attractive ornament, while at the bedside, either on a table, or suspended from the wall, it is most agreeable. It will not drop grease on the table-cloth or carpets, for its bearings are self-oiling, and carry on their own lubrication without loss or rejection of the lubricant, and the oil in the wells needs only to be changed whenever the battery is recharged.



BATTERY FAN MOTOR.

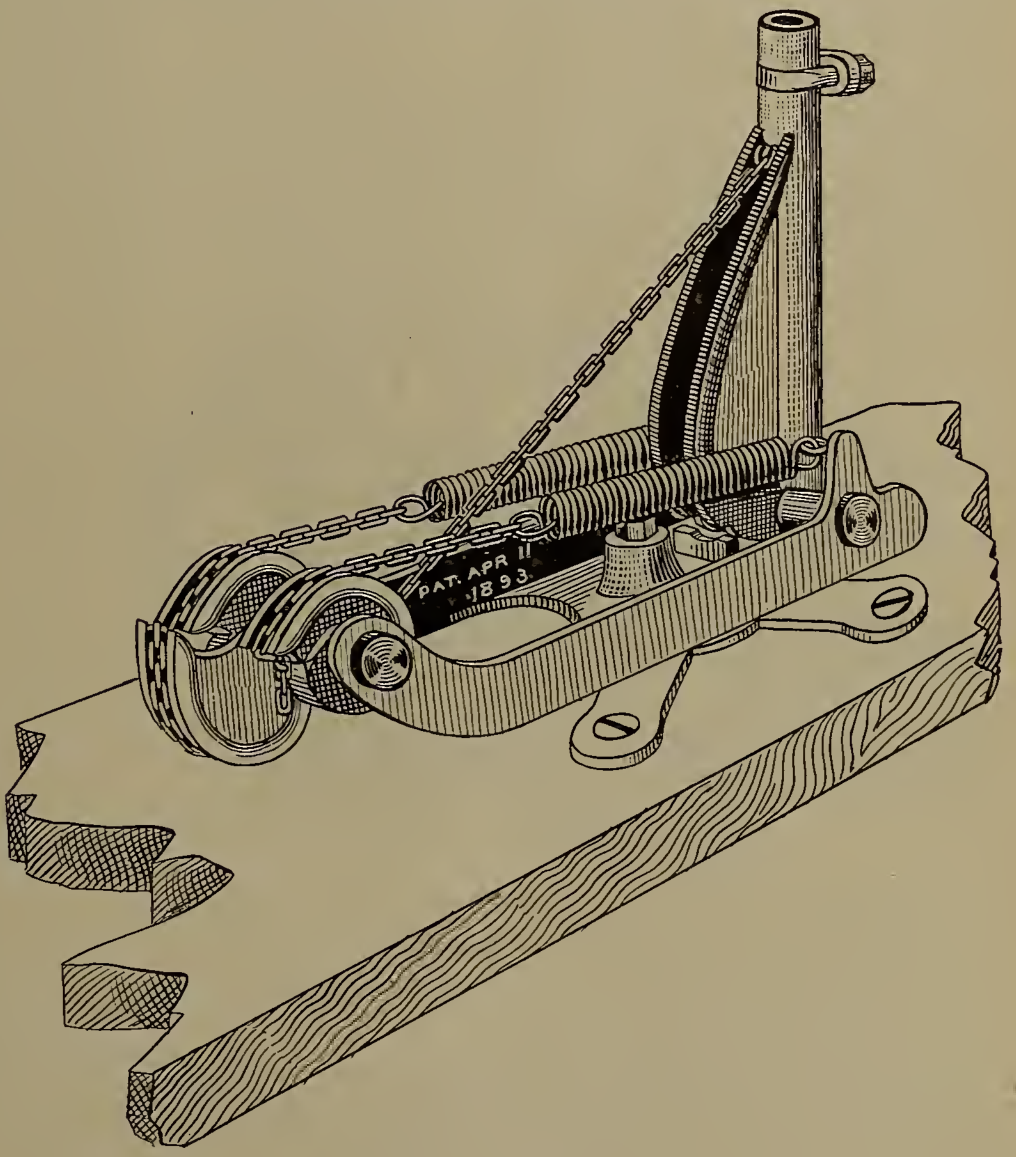
The armature, as the motor's name suggests, is entirely enclosed in an iron box or ornamental field frame, with a glass window at one end through which the brushes and commutator can be inspected. This arrangement combines all the advantages of an iron-clad motor as to compactness, safety, noiselessness, cleanliness, efficiency, etc., with the particular and novel feature of leaving the brushes always open to examination. To remove the glass window and readjust or replace a brush after months of wear is only the work of a few moments, and the plan adds greatly to the convenience, simplicity and finish of the machine.

For country villas, city residences, business offices, steamer cabins, etc., the fan will be in great demand during the summer weather. The battery box only occupies 18¾ x 7'' x 9¾'', and can therefore be always accommodated without inconvenience.

The Edison Manufacturing Company of 110 E. 23d Street, New York, is the sole manufacturer.

HEATH'S TROLLEY BASE.

Much ingenuity has been manifested by inventors of street railway appliances in regard to trolley bases. There are several important requirements for a base that is to be used on our ordinary railroad construction ; the trolley wheel should have a nearly constant pressure against the trolley wire, at any position of the trolley pole ; the springs should be in such adjustment that they do not weaken when the angle between the car roof and trolley pole is small and the trolley kept in that position for some time ; the trolley springs should have strength enough to force the trolley wheel close to the wire under such conditions as high speed and the tilting motion of the car, thus decreasing the chances of the wheel leaving the wire.



HEATH'S TROLLEY BASE.

The Heath Trolley Base has been tested and found to embrace these requirements. As shown in the accompanying illustration the principle involved is a cam device, whereby an automatic change of leverage as the pole is raised or lowered, and the tension on the springs become greater or less, is obtained. The chain on the pole cam rolls down near the pivot and on the opposite cam, thus offsetting the extra power exerted by the springs stretching, and at the same time giving the chain attached to the pole more travel than those attached to the springs.

The Heath Trolley Base is placed on the market by Frank Heath, 3207 Stevens avenue, Minneapolis, Minn.

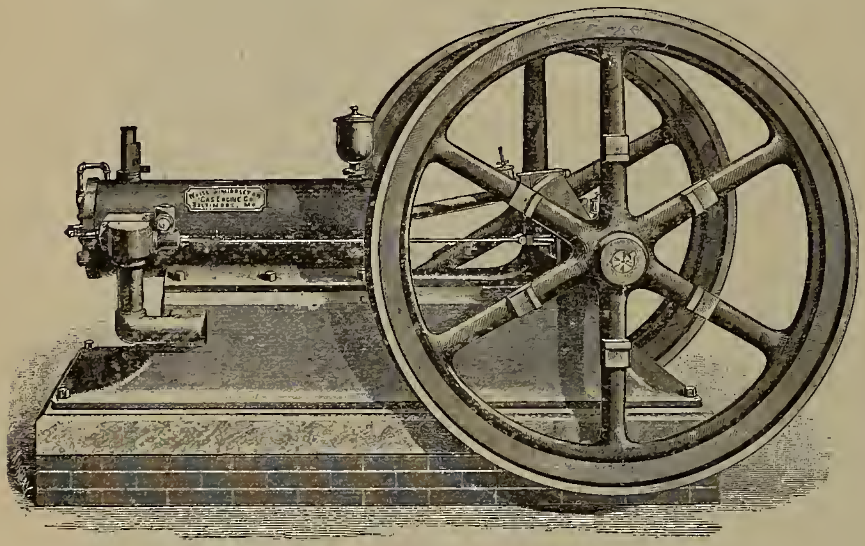
GAS ENGINES.

Jeffers & Kumberger, 156-158 West Broadway, New York city, agents for the White & Middleton Gas Engine have increased the size of their salesroom to twice its former dimensions. The room is lighted by forty incandescent and two "Ward" arc lamps, supplied with current from a sixty light Elektron Mfg. Co. dynamo, which is driven by a 6 H. P. gas engine of the above make. In addition to running the dynamo, the engine supplies the power for the machine shop, which is in the rear of the salesroom.

The White & Middleton gas engine is said to possess some valuable features, and in view of the fact that gas engines are rapidly coming into use for the operation of dynamos for electric lighting, a few words concerning these engines will be of interest.

The claims made for this engine are that for a given amount of work, it consumes less gas than any other gas engine made; that it runs steadier; requires less attention; makes less noise; is easier to keep clean, and is less liable to get out of order than any other.

The igniter is simple and durable in construction and design and never fails to work properly, and with the simple and substantial governor regular speed under varying loads is insured. The governor also controls the amount of gas consumed, so that it is always in proportion to the work done.



WHITE & MIDDLETON GAS ENGINE.

It is guaranteed that these engines will not consume more than 15 cubic feet of gas an hour per indicated horse power, taking the quality of Baltimore city gas as a basis.

Jeffers & Kumberger have installed four of these gas engines in electrical plants in New York city. Two 15-horse power engines are in the piano factory of Wesser Bros., on 43d street, running a C. & C. dynamo for light and power purposes.

One 15-horse power engine runs a 150 lamp dynamo in M. Fisher's shoe store, 146 Duane street, and one 6-horse power engine is used in running a Giant dynamo, at an establishment at the corner of 21st street and Tenth avenue, New York city. The firm is just now installing a 20-horse power gas engine in the storage warehouse at the corner of 67th street and Columbus avenue for the purpose of operating a dynamo for lighting and two elevators.

Two of these engines of 15 horse power each are used in the residence of G. P. Morissini, at Riverdale, N. Y., which is lighted by electricity. Gasoline is used for these engines and it is said that one gallon of the fluid, at a cost of five cents per gallon in Baltimore, will generate one horse power for ten hours. They are running two Elektron dynamos of 150 lights each and are belted directly to the dynamos, which are constructed especially for operation by gasoline engines. The lights in this installation are said to be perfectly steady.

The firm of Jeffers & Kumberger is composed of Warren H. Jeffers and Herman J. Kumberger. Besides being agents for the White & Middleton gas engines they handle general machinery, and elevators, and contract and install complete electric light plants.

C-S FLUSH AUTOMATIC SWITCH.

The phenomenal increase in the use of the incandescent electric light has developed a general inclination to adapt it to many special purposes, all, of course, tending toward greater convenience and efficiency, and the consequent demand of users for special appliances to perform special operations are often far ahead of the ability of those expert in the art to supply. No sooner is a demand of this character made known to the trade, than those interested in the production of such devices bestir themselves to meet the demand and supply the needed article. It is probable that in no other industry of the country has there been such general stimulation to invention as in this particular field, and amongst those who are steadily and surely keeping abreast of the times in this regard, the Cutter Electrical and Manufacturing Company of Philadelphia is well to the front with its well known line of "C-S specialties."

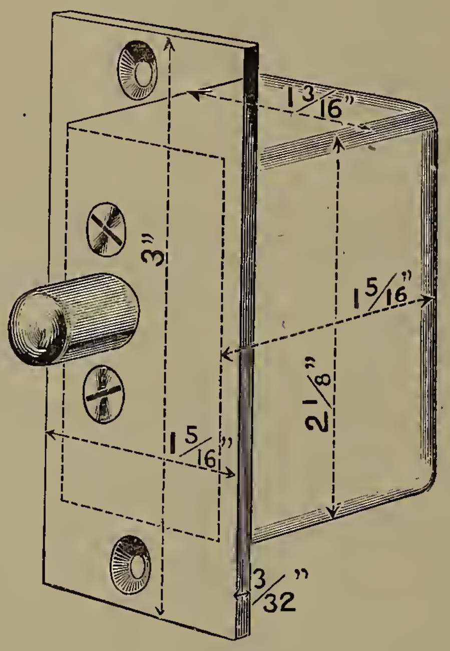


FIG. I.

A recent addition to this line of goods is a "Flush Automatic Switch" for use in bathrooms, dark closets, etc., etc.

This switch is set flush in the rabbet of a door jamb in a manner similar to the familiar burglar alarm spring, and its action is strictly automatic in all that the term implies. Every time the door is opened the light is turned on and every time the door is closed it is turned off. Nothing can be disarranged by the accidental opening or closing of the door at the wrong time, consequently it requires no attention or adjustment whatever, after it is once set up. This switch may also serve as an efficient burglar alarm, as an intruder is at once confronted by a bright light upon opening the door.

Another convenient application is to attach it to the front door so that an occupant of a house, upon entering, finds a hall light to welcome him. Although this device has been but a short time upon the market, it is already subject to an exceptionally flattering and steadily increasing demand from the trade. The newly erected New Netherlands Hotel in New York has already been equipped with several hundred of them, and we are informed that many other prominent hotels and institutions in the country are now being fitted up with this unique and convenient device.

Fig. 1 of the accompanying illustrations shows the "Automatic" complete in its fire and moisture proof casing, with its various dimensions, and when we state that the electrical arrangement and mechanical construction of this switch are practically upon the same lines as the C-S Flush Push Switch, which is so well and favorably known, it will be understood that this recent addition to the C-S specialties is perfect.

Fig. 2 gives a view of a C-S. single pole flush key switch, showing, also, the outside dimensions. The dimensions are accurate, so that, if necessary recesses in walls for the reception of the switches may be prepared in advance of their arrival. These switches are made in single and double poles and for three wires, and are fire and moisture proof. As the switch is turned by a key, tampering with it is impossible without the key. These switches are made of the best materials and carefully adjusted by experts.

The illustrated catalogue "C" of this company has a front cover that is a work of art. The letters of the words "C-S. Specialties" are formed with flexible lamp tubing and lamps, very artistically wrought, and is otherwise very attractive.

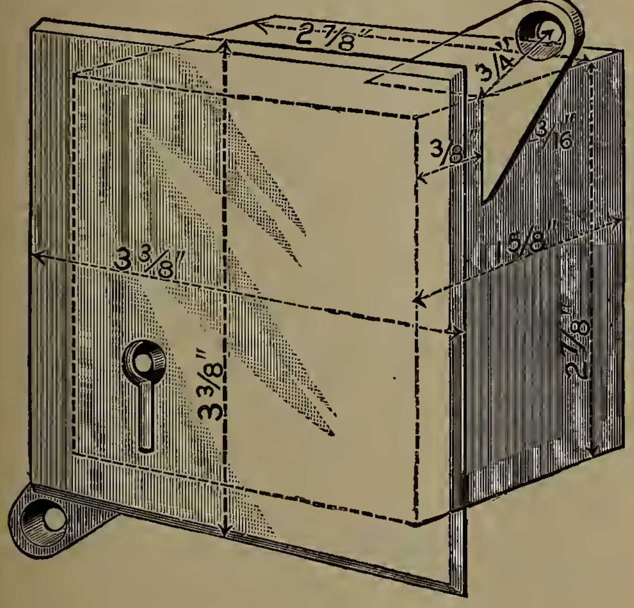


FIG. 2.

In this connection it may be of interest to state that the Cutter Electrical and Manufacturing Company has recently opened an office in New York city at 136 Liberty street, and placed it under the management of Mr. C. D. Shain. Mr. Shain is extensively known in the trade and will undoubtedly draw a large business for C-S. specialties.

WORLD'S FAIR CONGRESS.

The official list of delegates from Great Britain's scientific societies to the congress, to be held in Chicago, has been almost completed. Pedagogy will be represented by Professor Silvanus Thompson; engineering by Sir Benjamin Baker and Professor Francis Elgar; electrical work by William Henry Preece, Professor Silvanus Thompson, Alexander Siemens and Major Cardew.

Mortgaged—It is stated that the Detroit Electric Light and Power Co. has filed a mortgage for $350,000 to the Central Trust Company, of New York city. The mortgage covers the company's plant in Detroit.

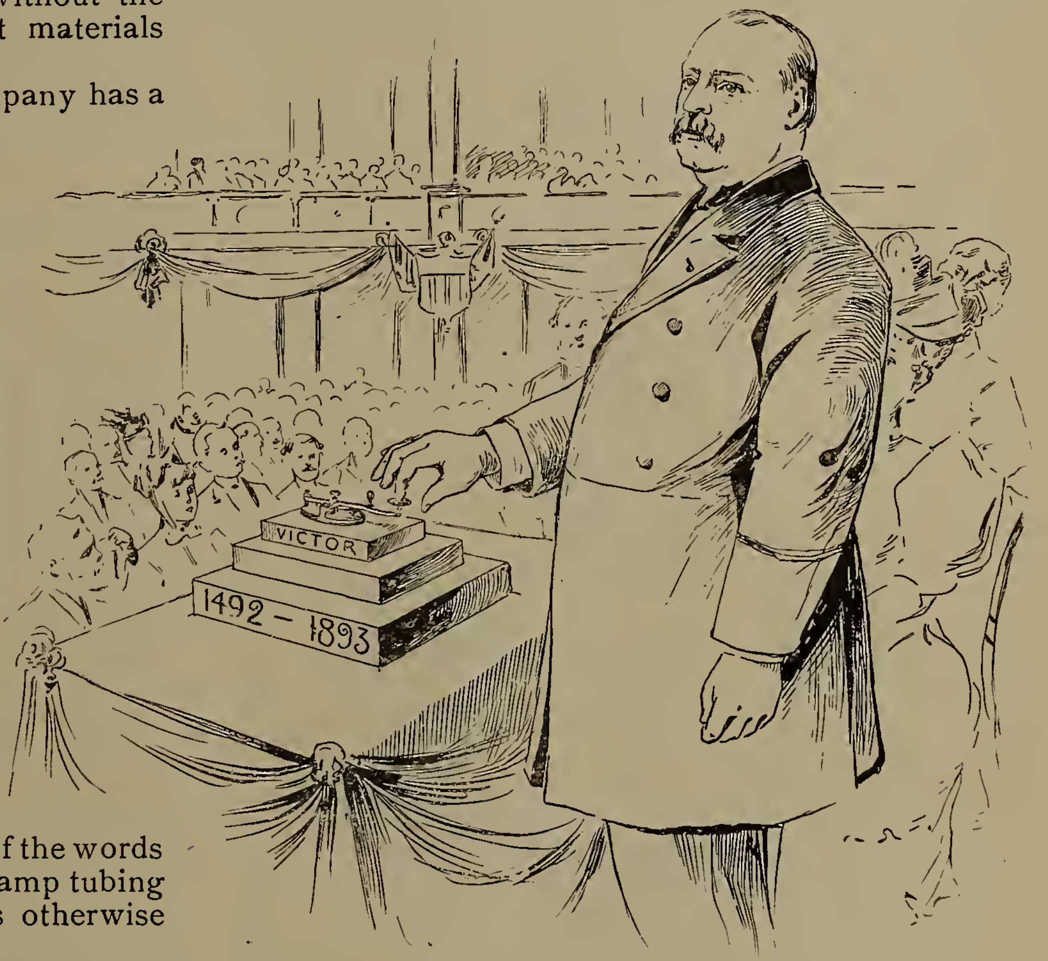
PRESIDENT CLEVELAND OPENING THE FAIR.

In our last issue was given a description of the opening of the World's Fair by a "Victor" telegraph key pressed by President Cleveland. Since then we have received a cut illustrating this event. We herewith publish it as we think it will be of general interest.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

At a meeting of the Executive Council of the American Electro-Therapeutic Association, held at the office of the Secretary, March 2, 1893, the following resolution was adopted:

"*Resolved*, That the Secretary be instructed to prepare a circular to send to Fellows of the Association, to members of the medical profession, to electrical experts and to manufacturers of electrical appliances for medical work, containing titles of all the committees, the members serving on them, with their addresses, and the matter prepared for discussion and investigation by each committee.



PRESIDENT CLEVELAND OPENING THE WORLD'S FAIR.

"And that manufacturers be asked to communicate with the members of the different committees, if they desire to have their instruments examined and tested, stating their claims and merits.

"And that physicians, electrical experts and manufacturers be asked to co-operate in making suggestions and in relating their experience and preference for instruments, with reasons and data.

"And to mail this circular to all members of the Association, manufacturers, medical journals and to others who are known to use electricity extensively, asking for a speedy reply either to the Secretary or to the members of the respective committee whom it concerns."

In accordance with these resolutions committees have been appointed to consider the following named subjects: Standard Coils; Standard Meters; Electro-Static or Influence Machines; Constant Current Generators and Controllers, and Standard Electrodes.

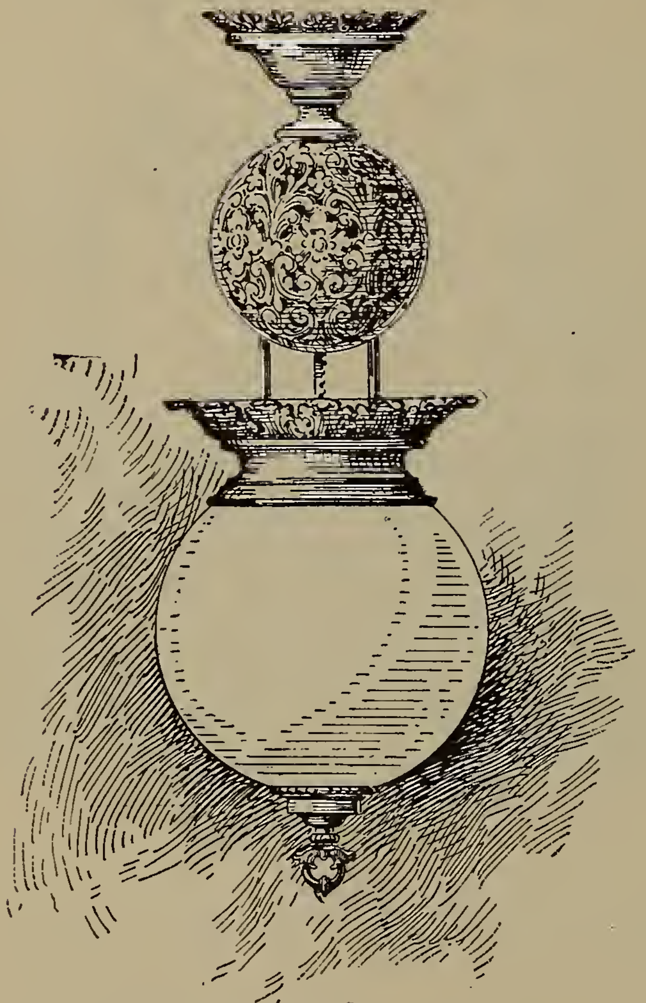
Margaret A. Cleaves, M.D., 68 Madison avenue, New York city, is Secretary of the Association.

INCANDESCENT ARC LAMPS.

The elegant line of incandescent arc lamps made by the General Incandescent Arc Lamp Company, 33d street and First avenue, New York city, is very artistically arranged in the company's show rooms.

In the Electrical Age of February 11, were given an account of this company and illustrations and descriptions of several of its lamps.

These lamps are designed for use on incandescent circuits and are remarkable for the steadiness of light and simplicity of construction and economy of operation. A large variety of designs are made, suitable for every purpose. In the show rooms may be seen a group of four Bijou lamps very artistically arranged on one chandelier. The Bijou lamp is intended for indoor use in such places as parlors, stores, etc. and is very beautiful in design. It is smaller than the ordinary arc lamp, and well adapted for situations where artistic effects are desired.



INCANDESCENT ARC LAMPS.

Another combination of Bijou lamps is a group of three suspended in a very graceful arrangement on one central fixture. The fixture itself is a work of art, being made of delicate filigree brass work, the frames of the lamps being of light character.

Besides these lamps a large variety of other designs are displayed, including the plain and ornamental varieties, finished in brass and iron, short lamps, theatre and large hall lamps, etc., etc.

The accompanying illustrations show two of the short lamps with globes and ornamentation of different designs.

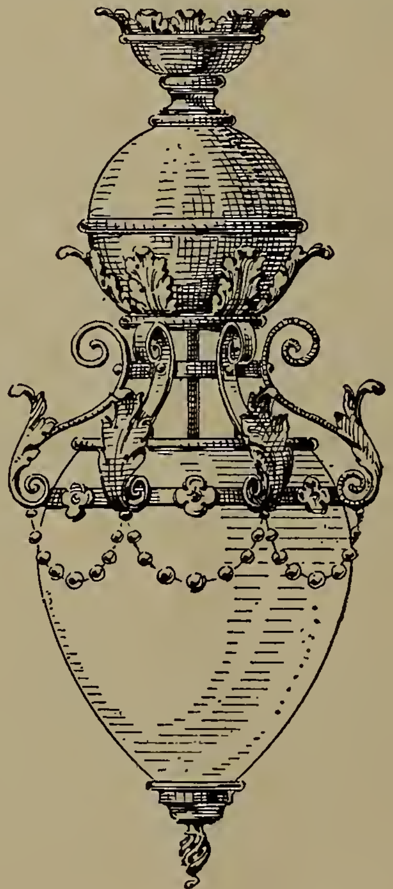
A VALUABLE TELEPHONE ATTACHMENT.

The Marcus auxiliary mouthpiece for telephones is a device whereby persons of different heights may use a telephone with equal ease. It is on the end of a tube bent at right angles, attached to the ordinary transmitter. It is made to rotate, thus varying its distance from the floor. It also concentrates the sound directly upon the diaphragm. The accompanying illustration shows one of these devices attached to a telephone transmitter. The funnel-shaped opening receives the air vibrations and they are carried through the tube to the diaphragm. No loud talking is necessary with this attachment.

TELEPHONE AUXILIARY MOUTHPIECE.

THE GENERAL ELECTRIC CO.'S WORLD'S FAIR EXHIBIT.

It was about a year ago that the attention of the companies now forming the General Electric Company was directed towards the Columbian Exposition and the chance afforded thereby of displaying in competition with the world the advances made in electrical development by American manufacturers. It was then that application was made for allotment of space for exhibit in Electricity Building. Due to numerous partial pledges by the Department of Electricity and the consequent necessity of effecting several mutual transfers in space alloted, it was late in the fall before the assignment of space as now possessed by the General Electric Company, was made in its favor. This final assignment of



INCANDESCENT ARC LAMP.

space gives to the General Electric Company the central spaces of the building. These spaces are five in number—the very centre of the building being a space thirty-four feet in diameter, where the General Electric Co. has erected a beautiful shaft, which, with its decorations of thousands of incandescent lamps, will be an appropriate central feature of the electrical exhibit of the exposition.

The entire length of transept, from the east door to the west door, has been assigned to the General Electric Co., and the spaces in the nave similarly situated and immediately adjoining the center. On either hand, immediately under the galleries, the spaces adjoining the central areas, have also been assigned to the General Electric Co., thus securing for its exhibit the entire central space of the Electricity Building, comprising over one-quarter of the ground floor, and fully one-seventh of the entire exhibit space available.

But this is not all, for in the contract for arc lighting, for motor service, for the great electric fountains, for service to the Electricity Building, for the charging of the storage battery launches, for the equipment of the Intramural Railroad, for the equipment of the U. S. battle ship and for search light projectors sweeping the entire horizon, the General Electric Co. has acquired at the World's Fair, business interests far exceeding the purely exhibition features.

It was at the very beginning of exposition work that the Edison General Electric Co. obtained a contract for the furnishing of the temporary light and power plant for the exposition. By the fall of 1892 this plant had increased so as to call for four arc lighting machines, two 100-K. W. 500-volt power generators and two low tension incandescent machines. From its installation until within a month past this plant has done continued incessant duty, under the most trying circumstances of overload, of hastily improvised expedients and generally discouraging surroundings. A plant put in for immediate needs of the time, it has continued many months beyond the originally estimated period of service. Although installation has been of a temporary character, the service has been uniformly reliable and satisfactory. Many motors have been placed throughout the grounds and buildings of the Expositon for hoisting, running saw-mills, pipe cutting machines and a multitude of other original applications that have reflected the greatest credit upon the ingenuity and the competence of the electrical and mechanical department of the World's Columbian Exposition.

Thoroughly appreciating the service, the Exposition Company has awarded the General Electric Co. the exclusive contract for furnishing of motors from one to 100 K.W. capacity for service of the World's Columbian Exposition during the year 1893. At the opening of the Fair there will be a multitude of motors from one to 130 horse-power engaged in all the varied service of this vast aggregation of wonders.

In the service lighting of grounds and buildings, the General Electric Co. will have an aggregate of thirty-five hundred 2,000 c.p. arc lamps. The largest building of the Exposition (Manufacturers' Hall), is lighted by the Thomson-Houston system exclusively, after designs prepared at the solicitation of the World's Fair, under the direction of the General Electric Co. These plans in all their studied detail reflect the greatest credit upon the noted lighting engineer, Mr. Luther Stieringer, who devised this novel method of even distribution of lights; also upon the Exposition's civil engineer who designed, contracted for, and placed the structures requisite for this most difficult piece of lighting work. It is safe to say that the large coronae of the Manufacturers' Building are without a rival in the lighting art.

To the same master hand designing the lighting of the Manufactures and Liberal Arts Building, is due the design of the great electric fountains, put in by the General Electric Company at the west end of the Grand Basin, facing the Administration Building. These fountains, two in number, placed on the lower terraces on either side of the McMonnies Emblematical Fountain, are without a rival in ancient or modern days in hydraulic or electrical design. Supplied from the high pressure system placed for the fire protection of the World's Fair by the Worthington Pump people, each one of these two fountains requires for its own individual service the full capacity of a 16-inch water main under 100 pounds pressure. Located as they are upon the lower terraces, the necessity arose for operating case mates below the surface level of the lake. The successful completion of these water-tight case mates, with their floors seven feet below the level of the water in the adjoining lagoon, reflects the greatest credit upon the engineering firm, the Fitz Simons & Conell Company, engaged upon this contract.

In illuminating these fountains, the General Electric Company had at its command its large experience in projector work for the United States Navy. Altogether, 36 of its 90 ampere projector lamps with burnished silver parabolic reflectors will, by their concentrated effort, illuminate in most enchanting fashion, the ever-varying streams of water projected through the nearly 400 apertures provided. The entire management of these fountains will be directed from the north-east tower of Machinery Hall. By means of the devices employed, both fountains can be made to operate as one. For maintaining the light, there will be used four 175 K. W. Edison bi-polar generators, the service to each fountain being on the Edison 3-wire system, with lamps placed across the mains in parallel. After the close of the evening's entertainment, the same machines will be used in charging the batteries of the electric launches. After five or six hours' charging, each little launch will have stored away in its hold about 40 H P. hours of effective electrical energy, sufficient for 10 or 12 hours' continuous run. This charging station, located south and east of the Agriculture Building, is the most extensive ever put in the United States, and probably in the world.

Upon the United States battle ship "State of Illinois" the General Electric Co. will show its unrivalled methods of ship lighting and the distribution of electricity for general ship's uses. Two standard naval direct-coupled, iron-clad, generating sets will be located between decks. In all her fixtures, her side lights, masthead lights, binnacle lights, lights for cabin, for magazine, for coal bunkers and for all other purposes aboard ship, the splendidly adapted, perfected, steam-tight and water-tight appliances of the General Electric Co. will be shown. Here also will be actively displayed several of its search light projectors ; one the largest projector ever made in the United States, or even in the world, a 150-centimeter projector with a 200 ampere lamp.

Of the Intramural railroad the efficient progressive general manager, Mr. W. E. Baker, can best write. Suffice to say that this most interesting, most valuable demonstration of the applicability of electricity to high speed interurban service, is looked upon with the greatest interest throughout the country. The freedom from smoke and dust, from smell and discomfort, from overwrought sympathies, at brutal treatment and overloading of sensate animals, together with the attendant comforts of well lighted and cleanly cars, will do more to assist in the popular rising of suburban light than any advance thus far made in the science of transportation. In the flexibility and reliability of the system; the easy extension of carrying capacity without a diminution of schedule time due to overloading of engines ; the easy extension of capacity without consideration of limits of strength of structure, will all be arguments in favor of electric traction strongly appealing to those most interested in elevated railway service.

As for the exhibit in the Electricity Building proper, it scarcely need be said that nothing of modern useful application of electricity to service has been overlooked by the General Electric Company, and all these applications will be illustrated, in fact or in photograph, within the area of this exhibit. In the one space stands the "Jumbo," the first instance of a direct coupled engine and dynamo. Showing the crudeness of the early days of its design, it still surely pointed the way to the modern type of dynamo with direct-coupled compound or triple expansion engine with efficiencies approaching the possible limit, and capacities of Titanic extent. This exhibit is loaned by the New York Illuminating Company, in whose Pearl street station the machine has done service for eleven years. In the same space will be shown the incandescent lamp of every type and voltage; and the only comprehensive system of distribution by feeders and mains. In the east centre space will be shown the alternating system with all its devices and in all its possibilities. Across the centre aisle its offspring (the multiphase system) will all appear in another exhibit. The application of electricity to marine service by high speed engines, directly driving small, compact, highly efficient dynamos, the search light projector, the dock and marine hoists, the uses of electricity in pumping, its perfection in devices for signaling at sea, will also be shown. The various applications of electricity to the needs of the miner, and the perfected systems for the transmission of power over long distances, will also be evidenced; the standard motor, and motors applied to locomotives, to derricks, to elevators will also be shown. We must not omit the display illustrative of the development of street railway service, nor the generators that up to a short time ago would have been considered as impossible creations.

The model arc lighting plant rendering the service lighting for the Electricity Building will be in one location, and last but not least, the incandescent lamp in all its decorative and service phases, will be most lavishly used.

Expositions have become more and more extravagant in expenditure and exhibitors have spent more and more of time and money in the attractive placing of perfected exhibits before the public eye. The Columbian Exposition is no exception to this rule. The grounds and the buildings are models of creative genius. The exhibits also, and particularly the electrical exhibits, will be markedly as excellent. Fortunate the man whose privilege it will be to have sufficient time for a proper enjoyment of the beauties of the World's Columbian Exposition, and especially fortunate he whose time is at his command and whose training is such as will enable him to benefit, to the fullest extent, by the opportunity for study offered by the electrical exhibits at the World's Fair.

EFFECT OF RETURN RAILWAY CURRENTS ON GAS AND WATER PIPES.

In view of the recent developments regarding the deteriorating action of return railway currents upon gas and water pipes laid under the surface of the ground the following abstract from a paper read by Mr. H. A. Allyn, of Cambridge, Mass., before the annual meeting of the New England Association of Gas Engineers held in Boston last February, will be of interest to our readers.

The subject matter of the action of the trolley system on underground work of metallic construction, was first called to the notice of Mr. Charles H. Morse, superintendent of wires of the City of Cambridge, by a complaint from the New England Telephone Company during the spring of last year. The Telephone Company claimed that the metallic covering of its cables was being destroyed by something which they firmly believed was due to the action of the ground current of electricity from the trolley wires.

The cables vary in size, those in use in Cambridge being about 1½ inch in diameter, and contain a large number of insulated telephone wires each. The sample which I have here contains 120 wires. Each cable is drawn into a lead pipe. This pipe in turn is drawn into a wrought iron pipe. Some 20 or more of these pipes are placed in a wooden conduit, spaces being left between the pipes, which are then filled in with cement concrete.

The top of this conduit is about two feet below the surface of the street. It will be readily understood that the construction of one of these conduits involves the expenditure of a large sum of money, and anything endangering its permanence is a serious menance to the Telephone Company. When the electrician of the Telephone Company first had his attention drawn to the fact that the cables were being in some manner affected, it was thought that the trouble might be due to the action of the acid used in preserving the wood of which the conduits were constructed. But a simple experiment seemed to fasten the responsibility on the trolley system. A voltmeter was connected with one of the cables in use, and the voltage of the current on the cable ascertained. Two pieces of new cable were then inserted in a barrel of moist earth, the conditions, as nearly as possible, being the same as those of the cable in use. Wires were then attached to one piece, and a current of the same voltage or force as that found in the ground was passed over it. In two weeks the piece of cable so connected was badly pitted, while the other remained perfect. It was suggested that the railroad company substitute the copper wires under the rails with some of a much larger size. The suggestion was adopted. In Cambridge, wires of about five-eighth inch diameter were employed, while in Boston the whole distance covered by the conduits was protected by a wire nearly an inch in diameter. For a time the trouble seemed to be over.

Now, under certain conditions, the current, in its endeavors to return to the power station, is liable to leave its proper road, and run "across lots," so to speak, by any feasible by-paths that may present themselves. The paths most easy of access are, of course, the gas and water pipes, and these the current appropriates to its purposes without regard to consequences. Now, if I understand the matter correctly. the action on the pipe which ensues is very similar to that in an ordinary cell of a voltaic battery. Anyone who has been unfortunate enough to have the care of many of these cells must be aware that in the zinc or negative pole a constant wearing away is taking place, necessitating frequent renewals. So with the pipes over which the trolley current happens to pass. No damage results where the current passes on to the pipes; when it leaves them, however, serious results may follow. Perhaps I ought to say that the wires have suffered at times in common with the pipes; but as we are not especially interested in that direction we will let that pass. During the autumn of last year many reports of leaking supply pipes were received at the Water Office. But as most of them came from a district where the soil was not such as would be conducive to longevity in the pipes, nothing, for a time, was thought of it. But as the reports became more frequent, the Superintendent became convinced that some influence other than the ordinary oxidation was affecting the pipes. The Water Board requested Mr. Morse to investigate the matter, and in a series of experiments he found currents of electricity flowing over the gas and water pipes in all parts of the city, though more particularly near the power station, the district where the supply pipes had been most acted upon. The trouble increased; some of the pipes were renewed, galvanized, tar coated, and "rustless" pipe being each tried in turn, but all were about equally affected.

In some cases new pipes were destroyed in a month's time. Not alone was the trouble confined to the supply pipes. In laying a twelve-inch main the packing yarn, while being driven, took fire. The joint maker received some severe shocks, and was obliged to drive his yarns with wood. In a building located on a corner, two water supplies were connected by a copper wire. Sufficient current was passing over the wire to heat it too hot to be held in the hand.

Mr. Morse requested the railroad company to connect the mains at frequent intervals with copper wires, more especially at the "dead ends" of the pipes. For a time it was thought this remedy might result in "robbing Peter to pay Paul;" or, in other words, while the change would prove beneficial to the water pipes, it would throw an additional burden on the gas pipes.

Mr. Morse therefore suggested that the gas and water supply pipes be connected by stout copper wires at numerous localities over the city, hoping that this plan might remedy the evil. The railroad company expressed a willingness to comply with the suggestion, and were preparing to do so.

Recent tests, however, lead Mr. Morse to think, inasmuch as the gas mains are connected by cement joints, that these may prove a source of protection, and that connecting the supplies might result in harm rather than good.

In a word, the whole question is of such recent origin and presents so many different phases that it seems to me the problem is far from being solved. I mentioned that up to date but one instance had come to our notice where the action of the electric current could be clearly connected with damage to our pipes. This pipe was a 1¼ inch galvanized pipe. After leaving the main it passed under the telephone conduit, then across the street, under two tracks. It was between these tracks that the break occurred. You will notice that the pipe is perfectly sound, except at each side of the coupling where the pipe is eaten through. I have here also a piece of water supply pipe. This pipe was attached to a 12-inch main near our works, and ran parallel with our fence for a distance of 300 feet, to within about 100 feet of the river. The current evidently left the 12-inch pipe and followed the smaller one in its endeavor to reach the river.

This pipe was also galvanized and had been in use only eight months. You will observe that the softer portion of the iron is pretty well eaten away. Here also the parts near the coupling have been most acted upon.

NEW BOOKS.

The Measurement of Electric Currents. By James Swinburne and C. H. Wordingham. Edited by T. Commerford Martin. Illustrated. D. Van Nostrand Company, New York. Price, 50c.

This little work embraces the papers read before the English Institution of Civil Engineers by James Swinburne and C. H. Wordingham; the former on "Electrical Instruments," and the latter on "Meters for Electrical Energy. These papers have been edited by T. Commerford Martin and published in book form. The papers review the latest advances in the production of electric current measuring instruments having more or less practicability to recommend them for the work of recording station output and securing station income. All of the principal American meters are described as well as those of foreign make, and the work deals with the subjects covered by it in a very comprehensive and clear manner.

Electricity up to Date. By John B. Verity. 163 pp. Illustrated, F. Warne & Co., London and New York. Price 75c.

This work, as its name implies, brings us "up to date" in electrical progress, and while it is written by an English author, and from an English standpoint, it is equally interesting to Americans. It is a popular description of various applications of electricity; is entirely devoid of technicalites, and is written in an easy and interesting style. A chapter is devoted to electro-therapeutics and "electrocution." The author, however, should "electrocute" the word "electrocution."

How to Make Inventions: By Edward P. Thompson. Illustrated. Second Edition. Revised and Enlarged. D. Van Nostrand Company, New York.

This is the second edition of the book brought out by the author a year or more ago. It contains a vast number of suggestive ideas in the line of improvements and inventions, and in looking over the pages it is surprising how extensive the field is for progress in every one of the arts and industries. Many people think that the field of invention is exhausted in many directions, but let them read this book and they will be astonished to learn how much room there is yet for improvement. Any one of an inventive turn of mind cannot fail to receive valuable hints from this work, and, no doubt, it will be the means of producing many future inventions. It is an extremely interesting book to have.

E. B. Treat, No. 5 Cooper Union, New York city, has just issued the new and revised edition of *Home Culture.* The idea of the work is self-instruction, and comprises text-exercises with answers in the various departments of education, with facts and figures worth knowing. A section of the book is devoted to electricity, and it imparts a good deal of general information on this subject in the form of questions and answers. The work complete is extremely interesting, and it is of such a varied character that anyone can take it up at any time and find something of interest and instructive, agreeable to whatever frame of mind the reader may happen to be in.

BOILER CAPACITY.

BY W. H. WAKEMAN.

In calculating the boiler capacity necessary to run a plant, it is customary to take a certain number of square feet of heating surface as being equivalent to a horse power. The number used depends on the kind of boiler that is under consideration, but the standard for a horizontal tubular is 15. Suppose that an engine is to develop 300-horse power. The total amount of heating surface provided is 4,500 square feet, on this basis, and it is equally divided between four boilers, so that each contains 1,125 square feet, which is equal to 75-horse power.

Suppose that these boilers are fitted with the ordinary stationary grates, and the coal being handy, one fireman cares for the four boilers, using hard coal for fuel. Under these circumstances he must clean his fires twice each day, and he will begin on the first one about 9 o'clock in the morning. He must of necessity clean the second one before the first one is burning in full blast, and third one before the second one is making much steam, and the fourth one while the third is still "coming up."

In the afternoon he must repeat the performance, and it follows, therefore, that twice each day he is practically running with three boilers, and these three boilers must develop 100-horse power each, for the engine calls for just as much steam while the fires are being cleaned, as it does at any other time (and sometimes it seems as if it needed more than ever just then), so that our 1,125 square feet of heating surface in each boiler will be called upon to do duty at the rate of one-horse power for each 11.25 square feet instead of 15 as was intended, which is a difference of 25 per cent.

Now if a device can be introduced into those furnaces whereby this cleaning of the fires in the ordinary way can be dispensed with, it is very plain that we can then do either one of two things, for if we keep the four boilers in use as before, we can maintain even fires in all of them, and each one will do its share throughout the day, and this share will not be an excessive amount, or we can lay off one of the boilers, and the work that each one will be called upon to do will be no greater than it was twice during each day, under the old custom of cleaning fires. Probably the former plan will nearly always be found better than the latter, for then we can run moderate fires, and do the required work easily, the consequence being that our furnaces will require less repairs and our boilers will accumulate less scale, and they will last much longer.

Now a successful shaking grate will accomplish these most desirable things, for by shaking them once or twice an hour, the ashes and clinkers may be removed from the bottom of the fire, which is certainly the proper way to do it. That this is a desirable feature, is attested by the fact that so many different kinds of shaking and dumping grates are in the market at the present time. It is not our province to advocate the use of any particular kind, but would say that it is quite possible that some of them are not successes, so that we would advise our friends who are thinking of purchasing something in this line to have them put in under a guarantee that they will accomplish the desired end, and if they do not, they shall be removed, and no charge made. This is the only fair, and it is also proper to stipulate for sufficient time to give them a thorough trial before they are accepted.

The writer was once in the employ of a concern who were endeavoring to introduce a new article into the market. It was their custom to put up packages of their goods and send them by express to parties who were using a similar article, or one used for same purpose. The goods were undoubtedly of good quality, and they were very much surprised to find that the people to whom they were sent would not pay the express charges on them and take them away for trial, but if they had been delivered free of charge many would have given them a fair trial. So it is in the case of shaking grates, for in many localities they have never been used to any great extent, and when they have been tried the trial has not been a fair one, and so it is worse than none at all.

We believe that a great improvement can be made in this direction, for by their use, in many cases, the present plant could be made to develop more power, or if this is not needed, or considered desirable, then the same amount of power can be developed under circumstances which will result in economy of fuel, longer life for the boilers, and be much more satisfactory in every way, but at the same time we believe that any party who has a thoroughly practical shaking grate to sell, will allow it to be tried before it is paid for, or in other words will sell it on its merits alone, provided it is to be given a fair trial, for it makes a great difference whether these appliances are used in an intelligent manner or not.—*Manufacturer's Gazette.*

Solid armature cores of iron evolve undue heat, and are wasteful of current. To avoid this effect the cores are laminated, that is, made up of thin discs.

DE MOTT FAN MOTORS.

As the summer months draw near, the fan motor business assumes greater proportions. It is indeed a great relief in the hot sultry days of summer to have on the desk, or over the dining table, one of these high speed noiseless little motors.

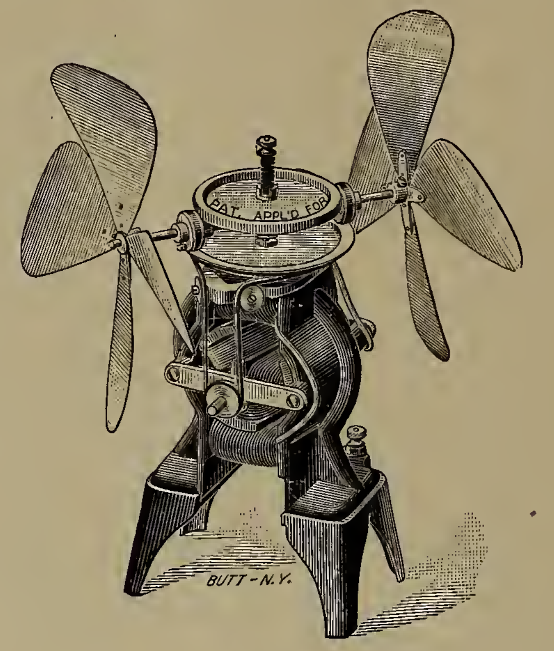


FIG. 2.

The De Mott Motor and Battery Co. has on the market many varieties of fan motors, and the batteries for operating same. Fig. 1 illustrates the "De Mott Motor." It is a high speed, low amperage machine. It is symmetrical in appearance and noiseless in operation; at the same time being so simple in construction as to insure its not easily getting out of order.

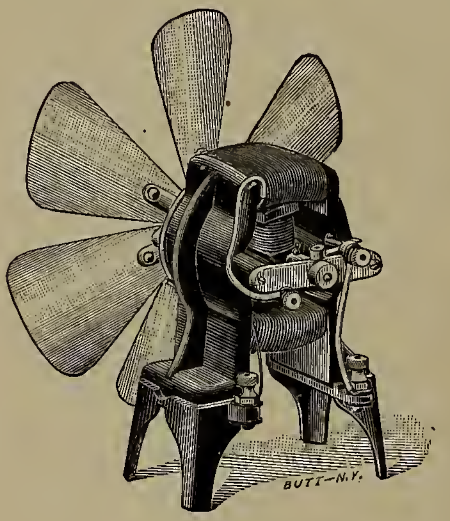


FIG. 1.

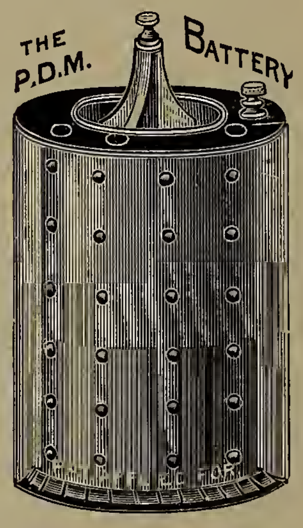


FIG. 3.

The company's latest fan motor is shown in Fig. 2. This is called the "De Mott Turret Motor." As this fan distributes a continuous current of air in circuit, it disposes of the objection so frequently made to the present style of fan motors, that only those sitting before them feel the benefit of the breeze.

The De Mott battery is made in two sizes. Type A, 5x7 for mechanical toys, models, etc. Type B, 6x8 for fan motors, telegraph and signal work. Fig. 3 shows this new cell. The company's place of business is at 173 Greenwich street, New York city.

Electric currents are frequently compared with currents of water in pipes, but there is a difference between the two. The water is kept within the pipe but the electricity is not confined to the wire; it manifests itself outside of the wire as well.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

ANNUAL MEETING AND ELECTION.

The annual meeting of the American Institute of Electrical Engineers will be held at headquarters, 12 West 31st street, New York city, on Tuesday May 16, 1893. Yearly reports will be received, officers elected and other business transacted at 4 P. M. In the evening, at 7 o'clock, a subscription dinner will be served at "The Arena," No. 41 West 31st street, and it is hoped that the members will avail of this opportunity to meet their fellow members socially. The price for the dinner is $2 per plate.

The general meeting of the institute will be held at headquarters on Wednesday, May 17.

The morning session for the reading and discussion of papers and reports, will be called to order at 10 o'clock.

The following papers will be read:

1. "On the Behavior of Fuse Metals in Direct and Alternate Current Circuits," by Mr Charles P. Matthews, of Cornell University, Ithaca, N. Y.

2. "A Modified Deprez D'Arsonval Galvanometer," by Lieut. Charles D. Parkhurst, of Watervliet Arsenal, West Troy, N. Y.

3. "The Variation in Economy of the Steam Engine due to Variation in Load," by Prof. R. C. Carpenter, of Cornell University, Ithaca, N. Y.

4. "An Automatic Printing Speed Counter for Dynamo Shafting," by Prof. George S. Moler, of Cornell University, Ithaca, N. Y.

At 1 P. M. a recess of one hour will be taken and a collation served.

AFTERNOON SESSION—2 O'CLOCK.

5. "Practical Aspects of Electrical Resonance," by Dr. M. I. Pupin, of Columbia College, New York city.

6. "The World's Electrical Congress of 1893." Discussion of the Provisional Programme prepared by the Institute Committee. This report with its appendices has been printed in the January and February issues of the Transactions, and absent members are earnestly invited to contribute in writing any comments they desire to make.

7. "High-Tension Generators for Direct Current Transmissions," by Prof. Francis B. Crocker, of Columbia College, New York city.

8. "The Heating of Armatures," by A. H. and C. E. Timmermann, of Cornell University, Ithaca, N. Y.

Adjournment.

NEW YORK ELECTRICAL SOCIETY.

The 152d meeting of this society was held at Columbia College, New York city, on May 5. Prof. F. B. Crocker delivered a lecture on "Dynamotors, or Direct Current Transformers." The subject was treated under the following heads: historical, design and construction, peculiar characteristics, and applications.

For the illustration of his remarks, Prof. Crocker had on the bench before him a Crocker-Wheeler Dynamotor, and that company's motors in two or three sizes, all of which were put into practical operation.

After the lecture the annual election of officers for the year 1893–94 was held, with the following result:

President, Joseph Wetzler; Vice-presidents, F. B. Crocker, Nikola Tesla, M. M. Davis, C. E. Emery, W. E. Geyer, W. J. Jenks and C. O. Mailloux; Treasurer, Hy. A. Sinclair; Secretary, George H. Guy.

The Secretary's report shows a membership of 309, a net increase during the past year of 17.

PORTABLE CONDENSER-RESISTANCE SET.

Mr. William Marshall of this city, has combined in one case a condenser and a high resistance set. This arrangement is especially valuable for use in testing for cable faults. Before, two boxes had to be carried and wired up, but under Mr. Marshall's arrangement only one is necessary.

In Fig. 1 is shown a combined box; the resistance coil of which is divided into two parts, each of 50,000 ohms, and the condenser having a capacity of ½ microfarad. The condenser is of the multiple-series type, each section having a capacity of $\frac{1}{10}$ microfarad. Special binding post plugs are used with these boxes.

Fig 2 illustrates another box with a different arrangement of the resistance coils.

Mr. Marshall is also the inventor of a condenser telephone, which promises to become of importance in the near future.

One form of the receiver consists of a case provided with perforated covers. Between the covers alternate layers of paper and of tin foil are placed. Every other disk of tin foil is connected to one of the binding posts on the case; the remaining disks are connected to the other binding posts. The covers are screwed together in such manner that the edges of the disks are compressed, while the middle is allowed to bulge out.

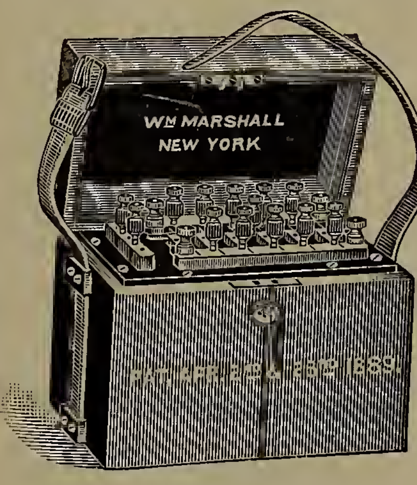


FIG. 1.

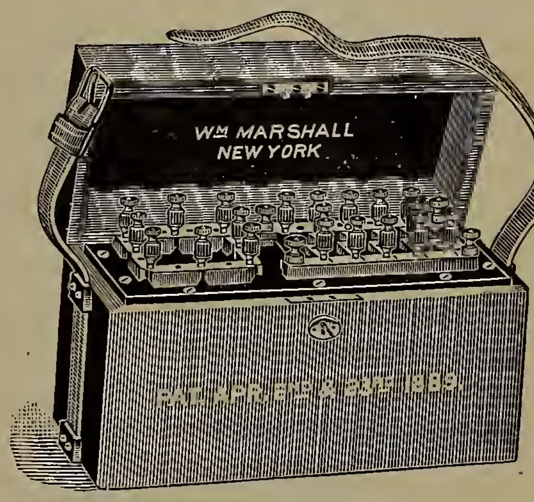


FIG. 2.

The invention consists essentially of a telephone system comprising speaking condensers and a transmitting induction coil at each station, each induction coil having two secondary wires and a primary wire, the opposite ends of each secondary wire being connected to opposite poles of the speaking condensers. The following is the first claim in letters patent No. 349,312, issued to Mr. Marshall on Sept. 21, 1886:

"1. In a telephone system with speaking condensers an induction coil at each station, said induction coil having two secondary wires and a primary wire, the opposite ends of each secondary wire being connected to the opposite poles of the speaking condenser."

The telephone acts remarkably well; sounds being perfectly intelligible even when the receiver is several feet from the ear.

Mr. Marshall is very widely known in the electrical industries, his condensers, it is said, having a record unequalled by those of other makes Marshall condensers are celebrated for their accuracy and freedom from breaking down.

Personal.—Mr. Clinton E. Woods, electrical engineer and designer of the alternating and direct current dynamos made by the National Electrical Mfg. Co, of Eau Claire, Wis., has associated himself with the Standard Electric Co., of Chicago, Ill.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

POSSIBLE CONTRACTS.

Alameda, Cal.—As soon as the Alameda new Board of Trustees meets, a delegation of citizens will attend and ask for better street lighting and the establishment of a light plant.

East Peoria, Ill.—A franchise was granted to F. L. Capps to construct and operate an electric light and power plant.

Forrest, Ill.—Forrest at the coming election will vote on the proposition to purchase an electric light plant.

Ft. Wayne, Ind.—The Fort Wayne Jenney Electric Light Company is to increase its lighting plant.

Groveland, Mass.—The Haverhill electric company desires to construct lines for the transmission of electricity for the purpose of lighting and furnishing power for this town.

Leechburg, Pa.—The citizens of this place are to vote on the question of electric lights.

Lewiston, Me.—The Gross Electric Light plant in Auburn is to be repaired and changed.

Waterford, N. Y.—A movement is being made to have the village lighted by electricity.

Wayne, Pa.—The electric light question is being discussed at Wayne.

POSSIBLE PURCHASES.

Haverhill, Mass.—The right to use the overhead electric system has been given to the Beverly & Danvers Street Railway Co.

Kingston, N. Y.—The railroad commissioners at Albany, heard the application of the Kingston City Electric railway to operate a railroad in this city by the overhead trolley system, and granted its application.

Middletown, Md.—New York parties are looking over the ground for an electric railroad between Frederick and Middletown.

Orland, Ind.—The citizens of this place desire an electric railroad.

Saratoga, Cal—It is stated that a railroad between Saratoga and San Jose is wanted.

Whitman, Mass.—It is said that the East Side and Whitman Electric roads will be entirely rebuilt this summer. Only the present rails of the old materials will be used again.

Syracuse, N. Y.—The State Railroad Commission has granted the application for a change of motive power to electricity of the People's railroad of Syracuse.

Weir Village, Mass.—The street railway at this place is to be changed to an electric system.

NEW CORPORATIONS.

Brooklyn, N. Y.—The Arverne and Rockaway Beach Electric Company, for furnishing electric power for lighting and other purposes in the town of Hempstead; capital, $50,000. Directors: R. Florence and C. C. Vernan of Arverne-by-the-Sea.

Chicago, Ill.—Calkins Electric Burner Company of Illinois, Chicago; capital stock, $120,000. Incorporators: Charles A. Warren, Richard B Twiss and A. Judson Montague.

Concord, N. H.—The Concord Electric Light and Power Co. has been incorporated with a capital of $200.000. Incorporators: H. W. Stevens, A. B. Cross, F. P. Andrews, Edson J. Hill, N. B. Hale and B. A. Kimball.

Denver, Colo.—The United Light and Power Company of Clear Creek county, with E. S. Wright, J. M. S. Egan, R. O. Old, F. P. Dewey, P. L. Roberts, F. R. Pneuman and C. S. Disen as directors, and a capital stock of $35,000.

Albany, N. Y.—The Rhinebeck and Rhinecliffe Street Surface Railroad Company was incorporated with the Secretary of State, April 18, to operate a street railroad from the Central Hudson railroad station at Rhinecliffe to East Market and South streets, Rhinebeck, a distance of three miles. The capital is $30,000. The directors are A. B. Hoffman, G. Esselstyn, D. M. Harris and H. A. Tripp, of Rhinebeck; and J. L. Williams, T. J. Swift, R. H. Hunter, E. A. Wilber, of Poughkeepsie, and R. M. Hoffman, of Red Hook.

Columbia, O.—A home company, known as the Madison Electric Light and Power Company, with the object in view of putting in a system of light here, was organized with a capital stock of $10,000.

Des Moines, Ia.—Articles of incorporation have been filed by the American Electric Debenture Company, capital stock $500,000; incorporators, Charles E. Humm, D. M. Evans and Eli S. Humm; object of the organization to deal in stocks and bonds. The first board of directors is composed of Stephen J. Young, Frank F. Reed, Omar H. Simonds, L. R. Casey.

Concord, N. H.—The Concord Light and Power Company, with a capital of $200,000, has filed articles of incorporation. The incorporators are Henry W. Stevens, A. B. Cross, H. M. Cavin, F. P. Andrews, Edson J. Hill, Napoleon B. Hale and B. A. Kimball.

Columbus, Ohio.—The Madisonville and Cincinnati Street Railway was incorporated in the office of the Secretary of State by Messrs. George W. Losh, C. L. Metz, W. H. Settle, C. M. Settle, James Julien and C. S. Mutchmore. The company is formed for the purpose of constructing and operating a street railway between the city of Cincinnati and the village of Madisonville, with the principal office in the latter place. It has a capital stock of $100,000.

Harrisburg, Pa. — The Second Avenue Traction Company, of Pittsburg, with capital stock of $1,000,000 was granted a charter at the State Department.

Indianapolis, Ind.—Articles of incorporation have been filed by the Martinsville Street Railway Company. The directors of the company are Henry A. Smock, Henry Dryden, Elliott F. Branch, Minor G. Branch, Oscar Matthews and Robert H. Branch. It has a capital stock of $25,000 and proposes operating an electric line in the town of Martinsville. The incorporators are also stockholders in the Martinsville & Indianapolis electric railway which is now being constructed.

The street railway company, whose bid for the new franchise drawn recently by the Board of Public Works was accepted a few days ago, has filed articles of association. The name of the company is the City Railway Company. Its capital stock is $2,000,000. The incorporators are John W. Murphy, August Keifer, Frederick Fahnley, Geo. A Dickson and H. C. G. Bals. J. W. Murphy is President; A. Kiefer, Vice President; H. C. G. Bals, Secretary and F. Fahnley, Treasurer.

GENERAL ELECTRIC IN WALL STREET.

During the panic in Wall street last week General Electric stock suffered heavy declines with many of the other industrial securities. On Friday, it dropped from 80 to 58, a decline of 22 points, but recovered at the close to 79¾ bid, 81 asked. These figures show that there is confidence in the General Electric stock, of which 29,130 shares changed hands during Friday.

THE BUCKEYE LAMP FACTORY RE-OPENED.

The Buckeye Electric Company, of Cleveland, Ohio, has resumed the manufacture of its well-known Buckeye incandescent lamps. This company closed its factory of its own accord prior to the decision in the Columbia lamp case in St. Louis, and it was not in any way legally involved with the Edison Company. Consequently, in view of the decision, it is free to manufacture lamps, and it is receiving many orders.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, May 6, 1893.

Mr. W. A. Vail, General Sales Agent, Electrical Exchange Building, 136 Liberty street, city, is very busy filling orders in his various specialties. Large sales are being made of Wirt lightning arresters and Walker ammeters. Recent orders call for 200 Swinging Ball lightning arresters. He sold 300 of these instruments in April. He has just closed an order for 55 cells of storage battery, 150 ampere hours each. It is said that "success always follows the fat."

Mr. Z. Latshaw, New York manager of the National Electrical Manufacturing Co. of Ean Claire, Wis., has recently sold 1,200 light alternating dynamo at Watkins, N. Y.; one 600 light machine at New Paltz, N. Y.; one of 600 at Long Branch, N. J., and one of 600 at Newtown, L. I.

Mr. E. T. Greenfield, of the Interior Conduit and Insulation Company, 44 Broad street, is the inventor of an automatic voucher fastener. The fastening is accomplished with wire which is supplied to the machine from a reel.

On May 2, thirty-five linemen in the employ of the New York and New Jersey Telephone Company went on strike in Brooklyn for an advance in wages from $2.50 to $3 a day. They are members of the National Electric Wire Workers' Union. The men employed by the surface railroads using the trolley wires have made a demand for the same wages.

The Universal Electric Launch Co., of 45 Broadway, New York city, and 45 and 47 York street, Brooklyn, is building electric launches of various sizes for stock and immediate delivery. The sizes in stock will be from 16 to 40 feet in length. They will be driven by Riker motors supplied with current from Union storage batteries. The officers of the company are Andrew L. Riker, president; S. R. Bradley, jr., vice-president; Thomas L. Proctor, secretary and treasurer.

The National India Rubber Company, manufacturer of N. I. R. rubber covered wires and cables, 487 Broadway, city, has taken some large orders recently for its celebrated goods. Mr. H. L. Burdick, the New York manager, a few days ago closed orders for nearly 100 miles of rubber covered cable for electric light and power use with a core composed of seven No. 6 stranded copper wires. The Enterprise Electric Company, Chicago, the Western representative of the National India Rubber Company has placed an order with the factory at Bristol, R. I., for 1,000,000 feet of small wires for electric lighting.

The Wright Universal Electric Co., 26 Whitehall street, city, reports a very large trade in its bicycle primary batteries and lamp outfit. This outfit can be readily attached to any bicycle, and the fact that such firms as Gormully, Jeffrys & Co., Peck & Snyder and Merwin, Hurlbut & Co., of New York city, have adopted them is sufficient evidence that they possess merit. The orders from these firms alone keep the factory of the Wright company busy. The H. N. H. Electric Company, of Boston and New York city, is selling large numbers of these batteries and lamps, as well as the other specialties of the Wright Co. The latter concern is bringing out a line of motors of from $\frac{1}{12}$ to 5 H. P., designed for use in connection with its primary batteries. The sizes from one-half to three H. P. are being made especially for small boats and launches, and it is said they are capable of a speed of 2,500 revolutions per minute. These high speed motors are guaranteed to reverse quickly by the turning of a simple reversing switch, especially constructed for them. The large sized motors are designed for general power purposes. Large numbers of the Wright Co,'s primary battteries, portable lamp and battery combinations, etc., are being shipped on orders to the Southern States and to South American countries, and the managers of the company feel happy over the general favor with which their specialties are meeting, not only in the United States but in foreign countries.

Messrs. O. Chan. Wells and Charles Albert Coutan have formed a partnership under the firm name of Wells & Coutan Co., Limited. The new company is to engage in the manufacturing of standard steam vacuum gauges and kindred goods. It is agent for Messrs. J. E. Lonergan & Co. Mr. William A. Locke, formerly of the Ansonia Brass and Copper Co. is associated with the above concern. The headquarters of the Wells & Coutan Co. are at 29 and 31 Gold street, New York city.

Mr. John R. Coffman, of the Eureka Tempered Copper Co., North East, Pa., was in town this week.

Mr. John A. Seely, the well-known electrical engineer and contractor for the complete installation of electric light and electric railway plants, will hereafter be found at 121 Liberty street, on the second floor, where he has comfortable and well-lighted offices. Mr. Seely is one of the best known men in the electrical trade. He was for several years the electrician of the Metropolitan Telephone and Telegraph Company, and it was under his personal supervision that the main telephone exchanges in this city were fitted out. He is one of the most active members of the National Electric Light Association and is a member of the executive committee of that body.

The Delafield Construction Company, 15 Cortlandt street, New York, General Contractor, Engineer and Builder of Electric Roads, Steam Roads, Sewers, etc., makes a specialty of construction, equipment and operation of electrical railways, plans and estimates for sewers, water work and other municipal improvements. The company also deals in railway supplies.

The automatic door-push gas and electric lighter made by the New York Electrical and Development Co., 251 William street, city, is meeting with a very large demand. Several hundred of them have been sent out by the company as samples and on orders. This little and practical device is taking like "hot cakes." The company will put upon the market shortly other ingenious electrical devices. It makes a feature of developing ideas, patents, etc., and is prepared to make any kind of a machine desired, and in any quantity. Keep your eye on these people!

Cleveland & Taylor, 5–7 Dey street, New York city, as a firm of practical electricians, have been in the electrical business for fourteen years. They do general electrical work. As they give installation work personal attention, first-rate results are secured. They have done electric light work in many of the large cities of the United States and of Canada The steam yacht Seneca had its electrical plant installed by this firm. They are now engaged in wiring Schmidt & Co.'s lithographic establishment, 9–11 New Chamber street, and installing lamps at 54 White street, using Bishop wire in both, and they have done electric light work in Montreal, St. Louis, Boston and other cities besides New York. They do all the electrical repair work for the steamers of Outerbridge Bros. W. T. H.

REMOVAL NOTICES.

The Eddy Electric Motor Co.'s office at 136 Liberty street has been moved to the Havemeyer Building, Church, Cortlandt and Dey streets, New York city.

The Conover Manufacturing Company, dealer in condensers and pumps, has moved from 95 Liberty street to 39–41 Cortlandt street.

W. R. Ostrander & Co, manufacturers of speaking tube and electric bell supplies have moved from 195 and 197 Fulton street, New York, to 204 Fulton street.

The Buckeye Electric Company has moved its New York offices to 49 Dey street.

Mr. R. H. Sherwood, the well-known contractor for electrical plants, has moved his office from 115 Broadway to 80 Wall street.

The International Trading and Electric Co., of which Mr. W. H. Fleming is general manager, has moved its offices from the Times Building to larger quarters at 40 Cortlandt street, New York.

The Complete Electric Construction Co. has moved from 10 Cortlandt street to 121 Liberty street, second floor. The company's new quarters are pleasantly situated and well lighted.

The Edison Mfg. Co., jewelers' specialties, has moved to the Havemeyer Building.

The Electrical Manufacturing and Gas Engine Company has moved its offices to the Havemeyer Building.

The Rollason Gas Engine Co. has moved from 136 Liberty street to the Havemeyer Building.

The Peckham Motor Truck and Wheel Co. has moved its offices from 45 Broadway to 1,006 Havemeyer Building, Church, Cortlandt and Dey streets.

W. S. Silver & Co., dealers in electric railway supplies, have moved their offices to the Havemeyer Building.

The E. P. Allis Company, of Milwaukee, Wis., maker of the celebrated Allis engines, has moved its New York office to the Havemeyer Building.

The Electric Power and Storage Company has located its offices in the new Havemeyer Building.

PHILADELPHIA NOTES.

Mr. C. E. Trump, of the Novelty Electric Company, No. 54 North Fourth street, has returned from his trip to the Southwest with large orders for the Company's direct and alternating current fan motors. These motors are low in price and perfect in action.

The hotel in course of construction on the corner of Twelfth and Arch streets is supplied with the new rubber tube made by the Chicago Electric Seamless Covered Wire and Cable Co., 9–13 Mercer street, New York city. The firm of Harry S. Smith & Co., 607 Chestnut street, Philadelphia, Pa., has the contract for the electrical work. A New York Safety Engine and two direct coupled Eddy dynamos are to be installed.

Chas. E. White, electrical contractor, 501 Girard Building, Philadelphia, Pa., handles the goods of the Consolidated Electrical Manufacturing Company of Boston, Mass.

The Price Railway Appliance Company, No. 125 South Fifth street, Philadelphia, has an exhibit of its well known rail joints at the World's Fair. The location of the exhibit is in Transportation Building, W. S., Columns 5 and 6. These rail joints were fully described and illustrated in our issue of December 31, 1892. The Reading Railway Company is putting in 140 Price's Star Girder joints and 60 Spoke joints. The Price joints are believed to be the strongest yet offered to American railway service.

CHICAGO NOTES.

The Libby Glass Works, which will be in operation on the Fair Grounds, Chicago, will have a model isolated electric light plant on the Mather system. Various designs of Ward arc lamps will be so arranged as to attract the general attention of visitors.

The Ansonia Electric Company, Chicago, announces that it is ready to take orders for the new Sunbeam incandescent lamp, which has been thoroughly tested, and, it is said, will be found entirely satisfactory.

CATALOGUES.

The Standard Paint Company, 2 Liberty street, New York city, is sending out a new catalogue of its celebrated P. & B. electrical compounds for insulating purposes. The testimonials show that they are unexcelled as insulators, besides being water, acid and alkali proof and preservative.

The New York Insulated Wire Co., 13-17 Cortlandt street, New York city, J. W. Godfrey, general manager, has just issued the World's Fair edition of its price list, dated May 1. It will be recalled that this company's Grimshaw White Core wires, Grimshaw tapes and splicing compound, and Vulca electrical wire ducts are used exclusively for the incandescent installation at the World's Fair. For this reason these goods have become known as the "Nation's Choice." The price list also contains some valuable electrical data and tables for handy reference.

We are in receipt of a copy of a new illustrated catalogue, issued by M. R. Rodrigues 17 19 Whipple street, Brooklyn, N. Y. He carries a full line of small electrical appliances and specialties

The Edison Decorative and Miniature Lamp Department, Harrison, N. J., has just issued a handsomely gotten up catalogue of small incandescent lamps for decorative and special purposes. These include candelabra lamps, special series lamps, battery lamps, receptacles and shades for the same. The catalogue is well illustrated, showing the different styles of lamps.

QUEEN & CO., AT THE WORLD'S FAIR.

We have received from Philadelphia an attractive pamphlet, "Some features of the World's Columbian Exposition," issued by Queen & Co., incorporated, from a perusal of which it is evident that the exhibits of this concern cannot fail to prove of interest to all who appreciate high grade apparatus, electrical and otherwise.

To the readers of Electrical Age the name "Queen" at once suggests electrical testing instruments, and it may surprise some to learn that while a large department is devoted to such apparatus, it is only one of several others which embrace scientific appliances of almost every description.

Five separate exhibits are made necessary to properly exploit the various branches, one in the Electricity Building and four in the Liberal Arts Building. Queen & Co. will be glad to mail a copy of the above pamphlet to intending visitors who will find it of much assistance, containing as it does general information regarding Chicago and the Fair, and exact particulars as to the location and character of each of their exhibits. Application should be made at once as the supply is limited.

The Electrical Age's Illustrated Record of Patents.

Issued May 2, 1893.

496,427. Electrically Operated Overhead Traveling Crane. William H. Morgan, Alliance, Ohio, assignor of three-fourths to Thomas R. Morgan, Sr., Thomas R. Morgan, Jr., and John R. Morgan, same place. Filed July 22d, 1891.

496,429. Gravity Brake for Vehicles. William H. Morgan, Alliance, Ohio, assignor of three-fourths to Thomas R. Morgan, Sr., Thomas R. Morgan, Jr., and John R. Morgan, same place. Filed Nov. 25, 1891.

496,432. Magnetic Crane. William H. Morgan, Alliance, Ohio. Filed June 9, 1892.

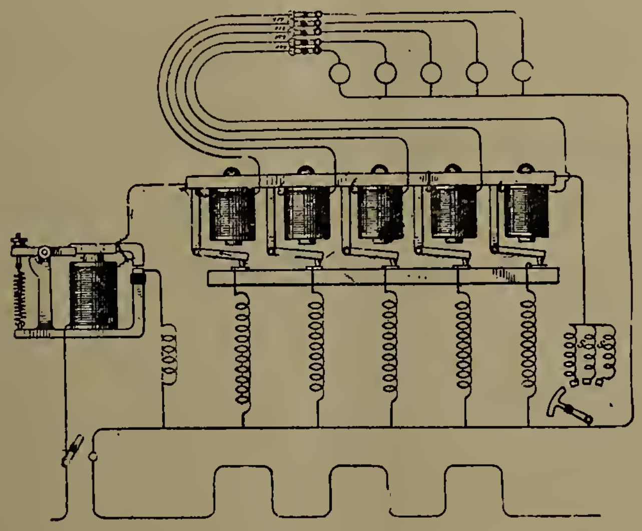
496,434. Overhead Traveling Crane. Thomas R. Morgan, Sr., Alliance, Ohio. Filed Jan. 7, 1893.

496,449. Perforated Pole-Piece for Dynamo Electric Machines. Charles E. Scribner and Ernest P. Warner, Chicago, Ill., assignors to the Western Electric Company, same place. Filed Feb. 7, 1890.

496,455. Electric Lighting System. Elihu Thomson and Edwin W. Rice, Jr, Lynn, Mass., assignors to the Thomson Houston Electric Company, of Connecticut. Filed Apr. 14, 1884.

496,456. Commutator for Dynamo-Electric Machines Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company of Connecticut. Filed Dec. 2, 1891.

496,474. Electric Bunch Light. Joseph Dillon, Larchmont, N. Y. Filed June 22, 1892.



496,655.—ELECTRIC LIGHTING SYSTEM.

496,500. Electrical Measuring-Instrument. Edward Weston, Newark, N. J. Filed Feb. 17, 1892.

496,513. Vibratory Telegraphy. Stephen D. Field, Yonkers, N. Y. Filed July 30, 1892.

496,514. Armature for Dynamo-Electric Machine. Waldemar Fritsche, Berlin, Germany. Filed Dec. 2, 1892. Patented in Denmark Nov. 18, 1889; in Germany April 16, 1890; in England April 16, 1890; in Belgium April 16, 1890; in Switzerland April 16, 1890; in Norway May 23, 1890; in Sweden May 23, 1890; in France June 5, 1890; in Italy June 30, 1890, and in Austria-Hungary Sept. 18, 1890.

496,517. Manufacture of Electrodes for Primary or Secondary Batteries. Rudolph T. E. Hensel, Dresden, Germany. Filed June 17, 1892.

496,519. Thermo-Mechanical Alarm. Philip Krumscheid, Boston, Mass. Filed May 20, 1892.

496,522. Controlling and Equalizing Electric Motors. David Mason, Schenectady, N. Y., assignor to the General Electric Company, of New York. Filed April 22, 1892.

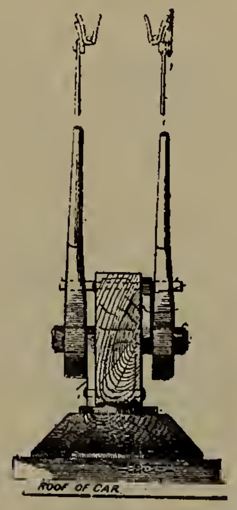
496,533. Electric-Distribution System for Railways. Nelson W. Perry, Cincinnati, Ohio, assignor of one-fourth to Thomas T. Gaff, same place. Filed May 27, 1891.

496,549. Printing-Telegraph Instrument. Alexander H. Wirsching, Brooklyn, N. Y. Filed June 8, 1892.

496,550. Electric Locomotive. Eben M. Boynton, West Newbury, Mass. Filed Dec. 7, 1891.

496,567. Utilizing Electric Motors for Operating Machinery. Carl Hoffman and Ernest Richter, Berlin, Germany, assignors to Siemens & Halske, same place. Filed Nov. 7, 1892. Patented in Germany Feb. 9, 1893.

496,592. Working Brass by Electricity. George D. Burton, Boston, Mass., assignor to the Electrical Forging Company, of Maine. Filed Sept. 28, 1891.



496,631.—DOUBLE TROLLEY POLE.

496,594. Electric Forge. George D. Burton, Boston, and Edwin E. Angell, Somerville, Mass., assignors to the Electrical Forging Company, of Maine. Filed May 3, 1892.

496,597 Electroplating Apparatus. Seth C. Catlin, Bloomfield, N. J., assignor to Emma F. Catlin, same place. Filed June 6, 1892.

496,618. Electric Gas-Lighter. David J. Quinn, Brookline, and Paul W. Hoffmann, Boston, Mass., assignors to the Iona Manufacturing Company, Portland, Me. Filed June 20, 1892.

PATENTS.—Continued.

496,631. Double-Pole Trolley. Thomas E. Adams Cleveland, Ohio, assignor to the Brush Electric Company. Filed June 11, 1889.

496,648. Magnet-Armature. Fred L. Gregory, Chicago, Ill. Filed Nov. 16, 1892.

496,652. Insulator for Telegraph Wires. Ralph G. Hemingray, Covington, Ky., and James C. Gill, Muncie, Ind. Filed Jan. 3, 1893.

496,659. Hot-Box Detector. Robert C. Kerr, and Peter Hardman, Fall River, Mass , assignors to the Kerr Thread Company, same place. Filed Nov. 26, 1892.

496,678. Voltmeter. Arakelyan H. Armen, Lynn, assignor to Duncan Gillis and Thomas W. Gleason, Boston, Mass. Filed Sept. 8, 1892.

496,690. Electric Alarm. Henry F. Kolbe, Detroit, Mich. Filed Nov. 14, 1892.

496,701. Electrode for Arc Lamps. John F. Sanders and Sarah J. Sanders, Portland, Ore. Filed June 15, 1892.

496,702, Electric-Arc Lamp. John F. Sanders and Sarah J. Sanders, Portland, Ore. Filed June 15, 1892.

496 710. Friction-Coupling for Dynamos or Motors. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company of Connecticut. Filed Dec. 10, 1891.

496,724. Burglar and Fire Alarms. William C. Dillman, Brooklyn, and George A. Seib, New York, N. Y. Filed July 11, 1892.

496,728. Electric Meter. Joseph Edmondson and Joseph Oulton, Bradford, England. Filed Sept. 29, 1892.

496,743. Element for Galvanic Batteries. Auguste L. De Mèritens, Paris, France. Filed Sept. 30, 1891. Patented in France Nov. 28, 1890; in Germany Dec. 9, 1890; in Austria-Hungary April 7, 1891; in Belgium May 22, 1891; in Spain June 30, 1891; in Italy June 30. 1891, and in Brazil July 29, 1891.

496,746. Correcting Electricity Meters. Joseph Oulton and Joseph Edmondson, Bradford, England. Filed Sept. 28, 1892. Patented in England, Nov. 2, 1889; in France July 22, 1890; in Belgium July 22, 1890; in Austria-Hungary Nov. 18, 1890, and in Italy Jan. 26, 1891.

496.775. Electric Forge. George D. Burton, Boston and Edwin E. Angell, Somerville, Mass., assignors to the Electrical Forging Company, Maine. Original application filed Oct. 6, 1861. Divided and this application filed Nov. 18, 1892.

496,787. Electric Signal Apparatus. Jacob W. Lattig, Easton, Pa. Filed Jan. 25, 1893.

496,791. Armature Attachment. William D. Packard, Warren, Ohio. Filed March 25, 1892.

496,792. Attaching Device for Electric Light Fixtures. George Peeples, Philadelphia, Pa., assignor to the Thackara Manufacturing Company, of Pennsylvania. Filed Nov. 19, 1892.

496,801. Electrical Testing-Outfit for Cables, &c. Edward W. Stevenson, New York, N. Y., assignor to Samuel L. Fox and Edward B. Fox, Philadelphia, Pa. Filed Sept. 1, 1892.

496,807. Electric Cut-Out. Augustus Wright, Providence, R. I., assignor to the Hope Electric Appliance Company, same place. Filed Nov. 9, 1892.

496,808. Electric Switch. Augustus Wright, Providence, R. I., assignor to the Hope Electric Appliance Company, same place. Filed Nov. 9, 1892.

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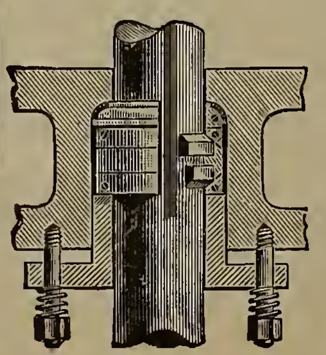

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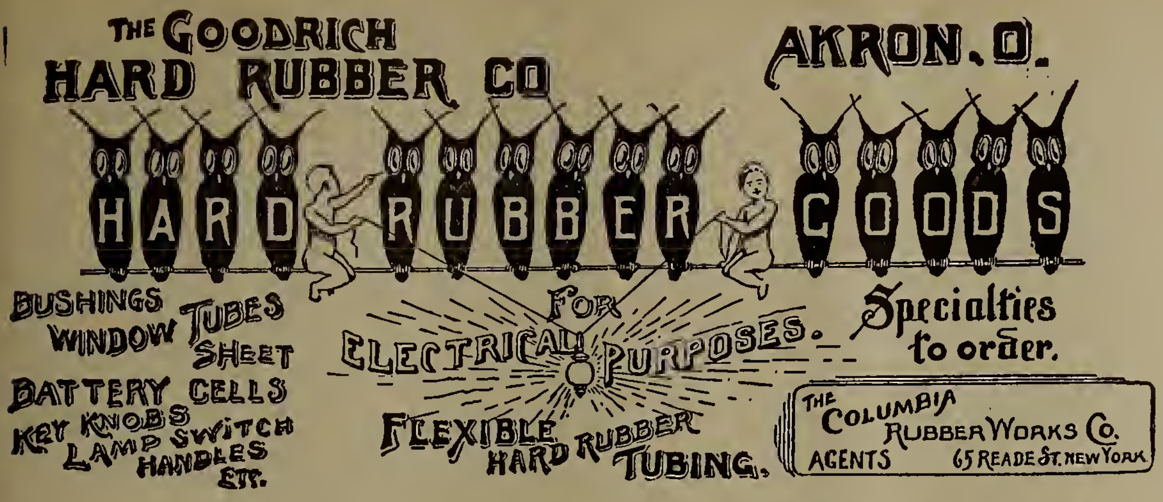

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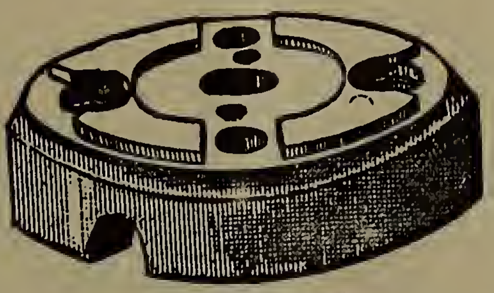

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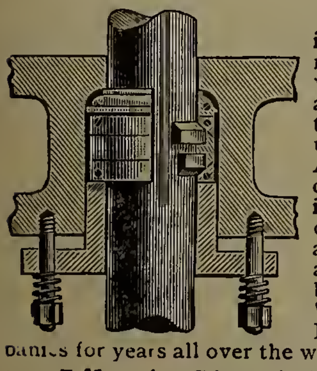

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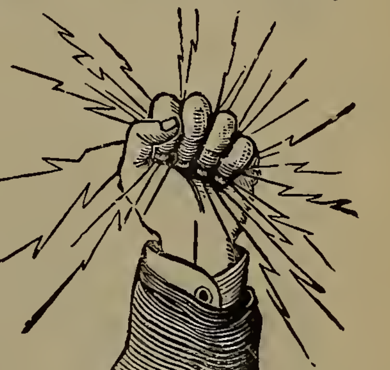

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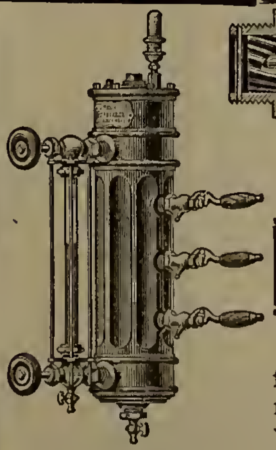

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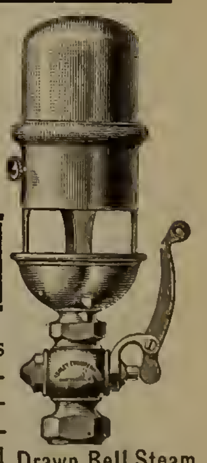

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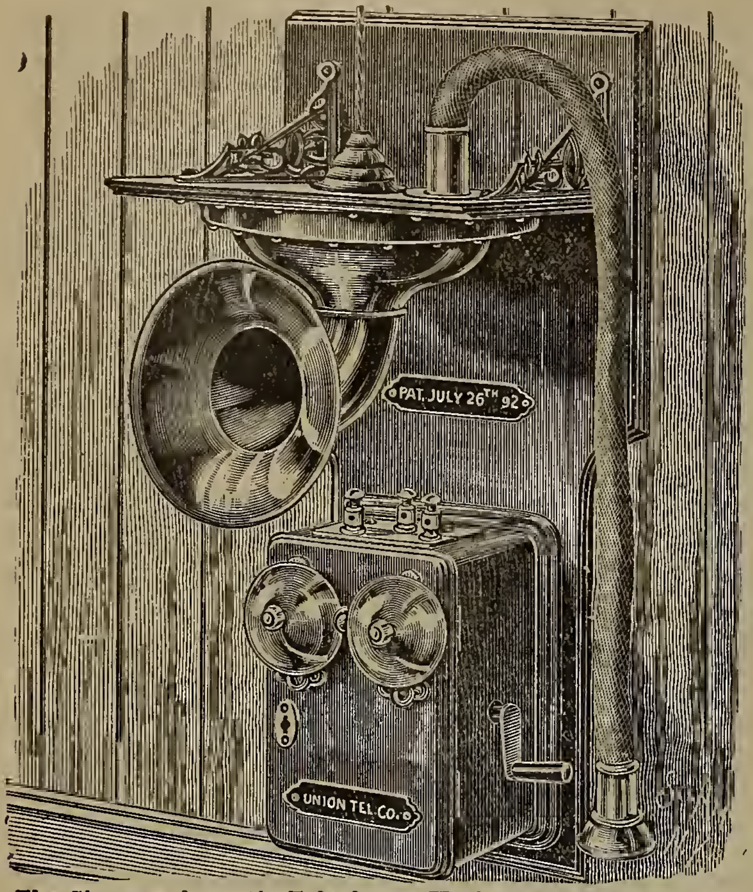

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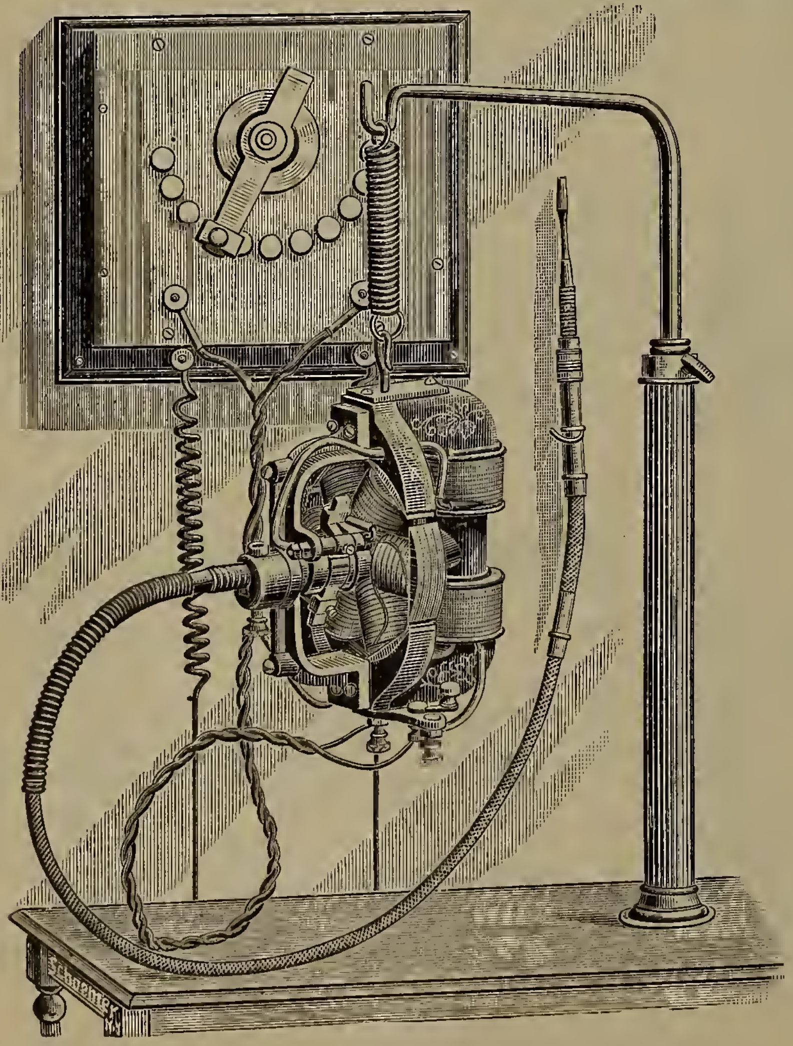

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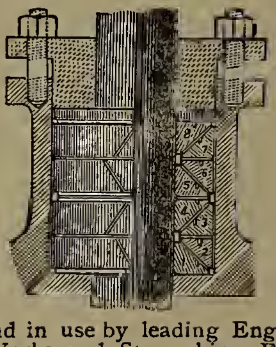

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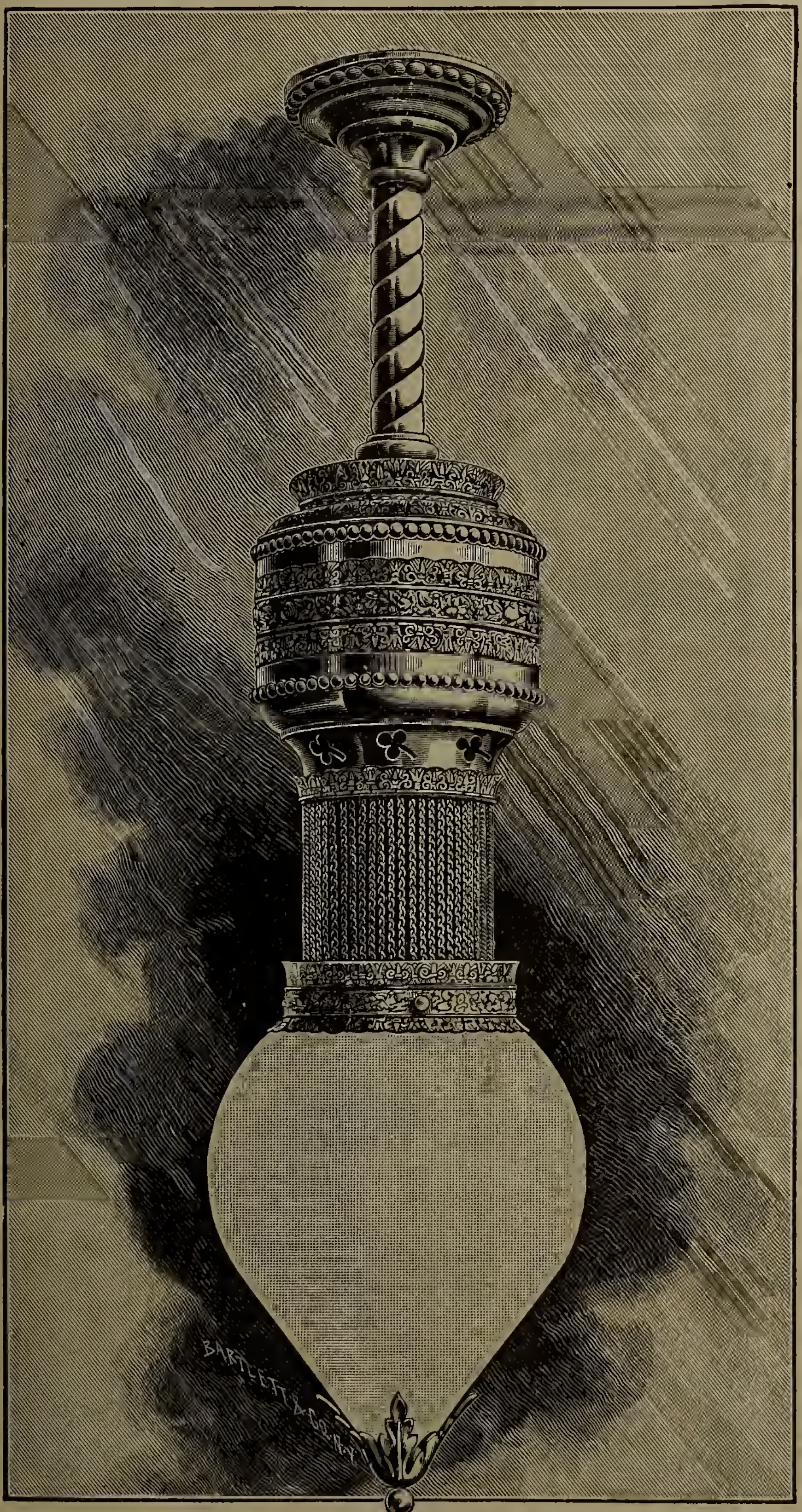

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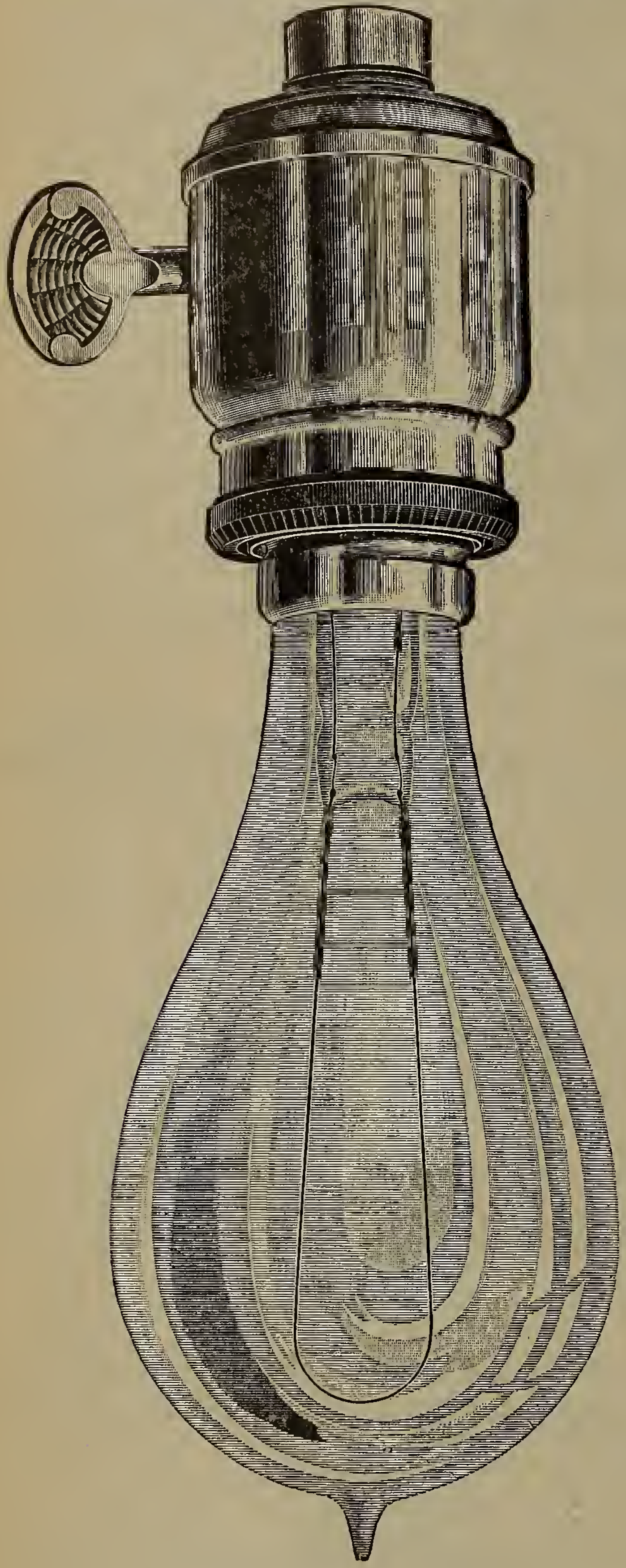

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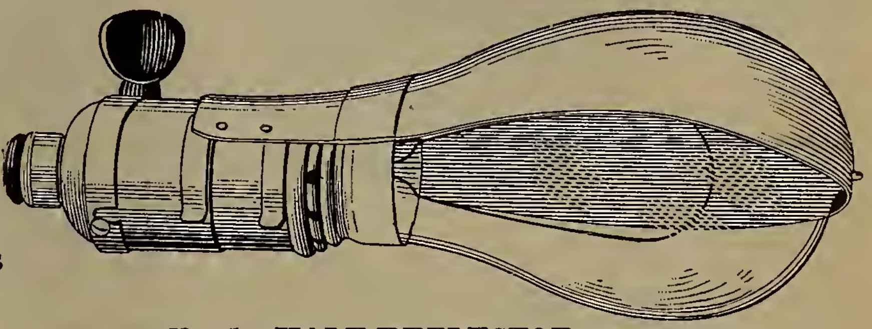

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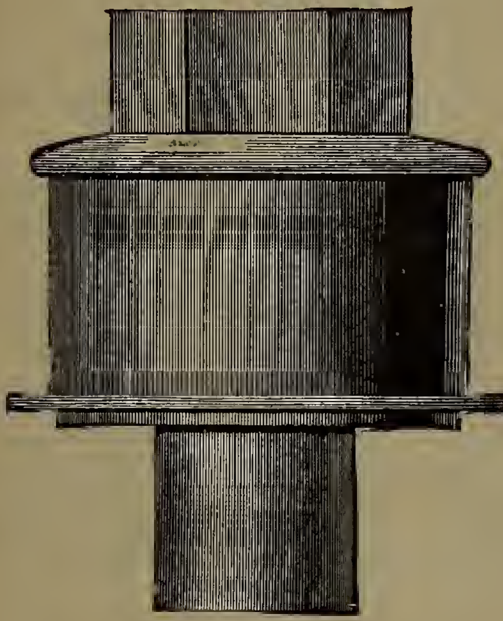

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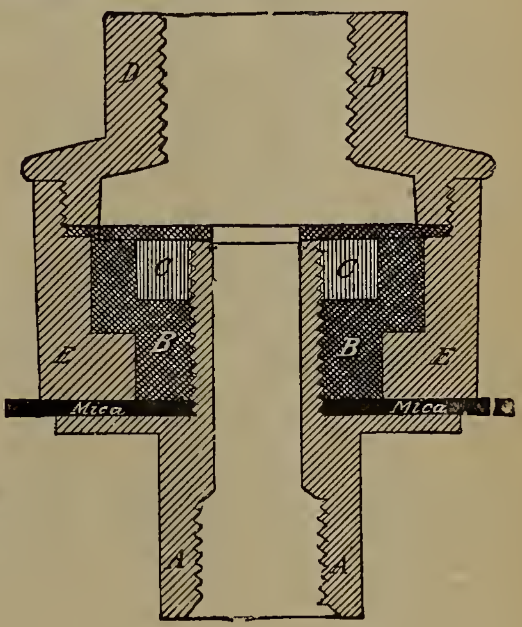

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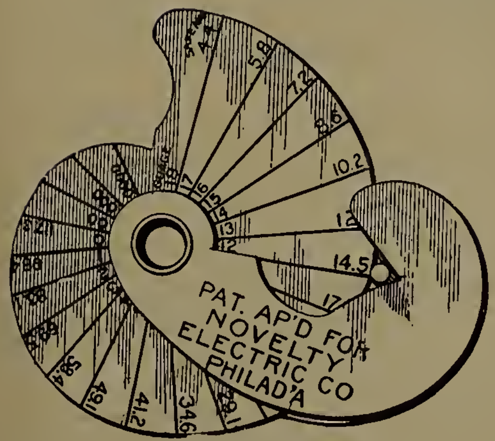

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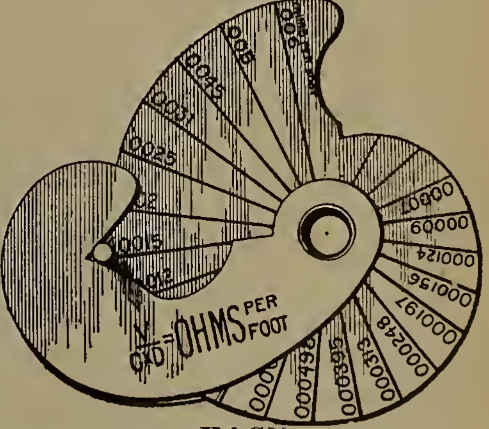

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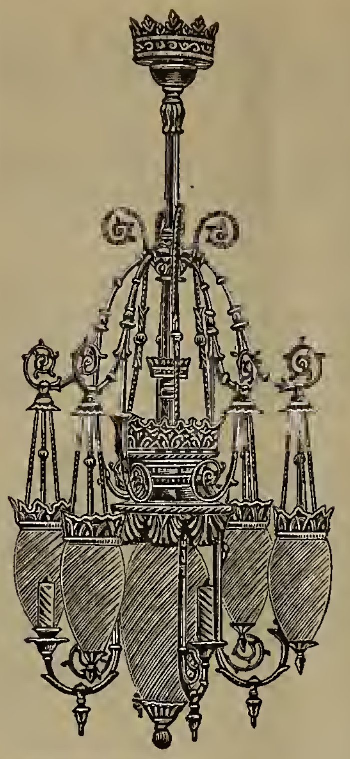

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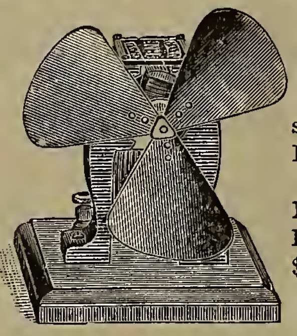

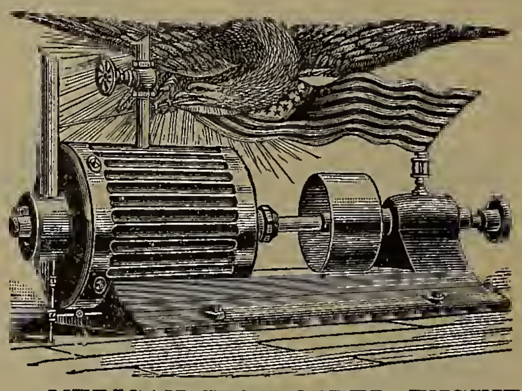

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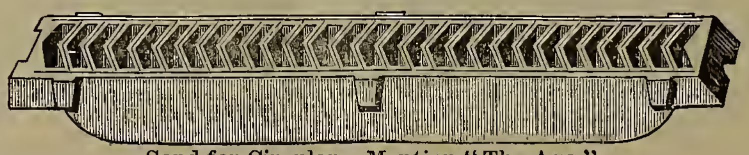

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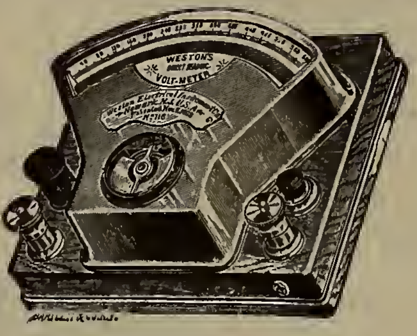

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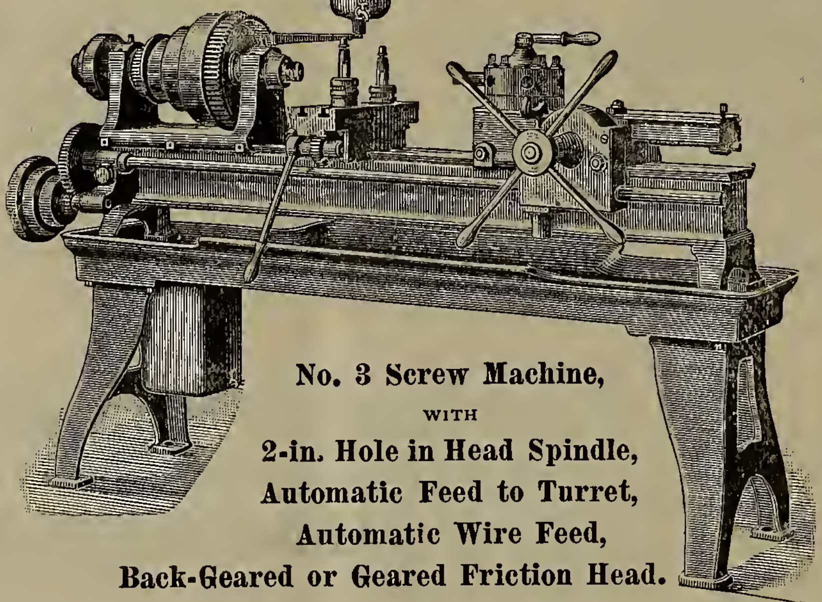

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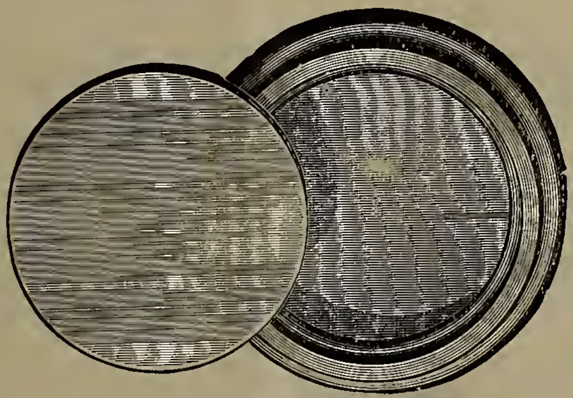

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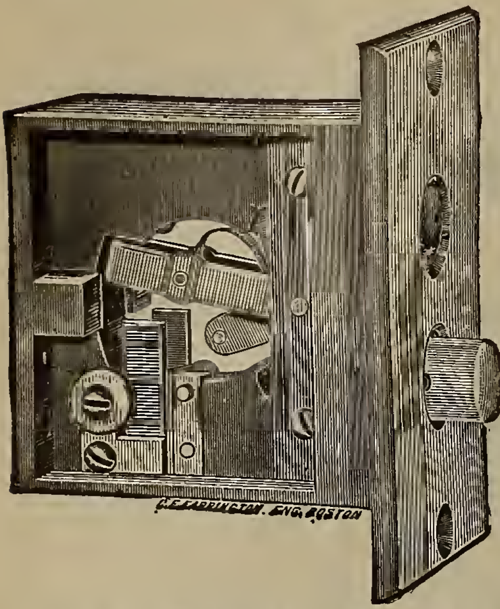

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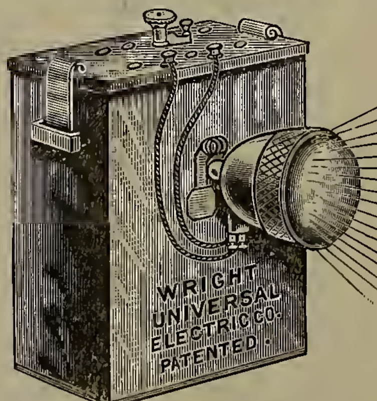
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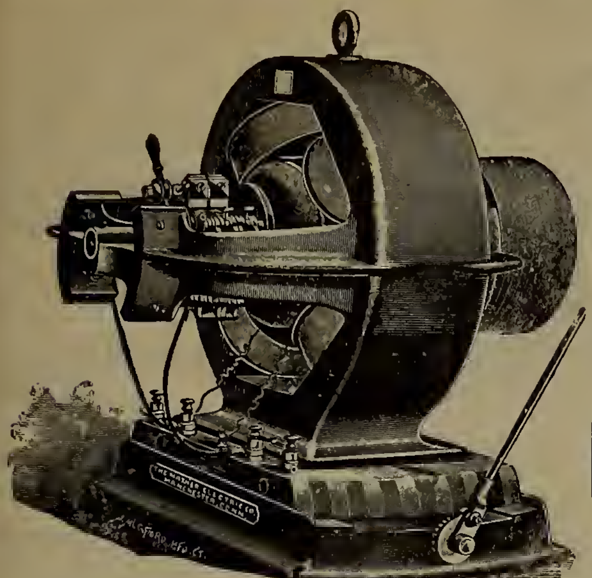

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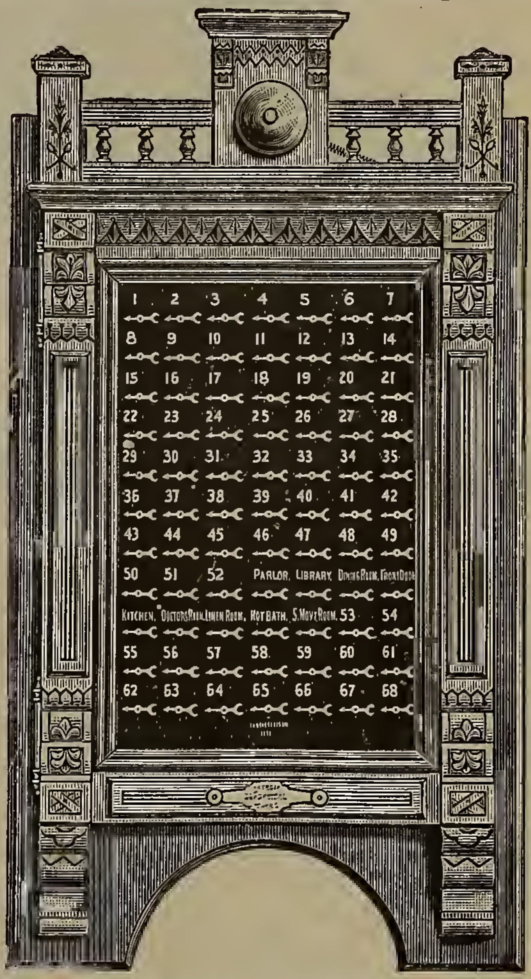

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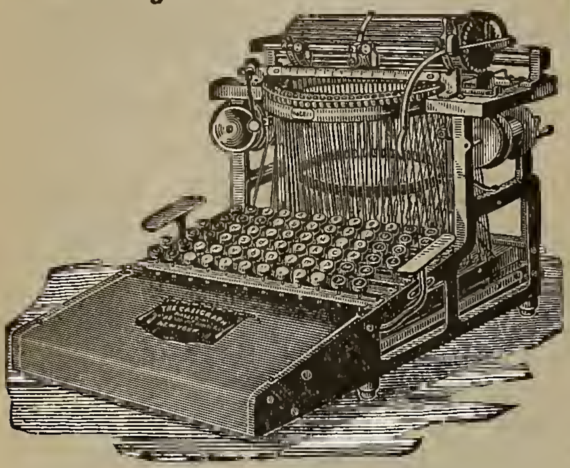

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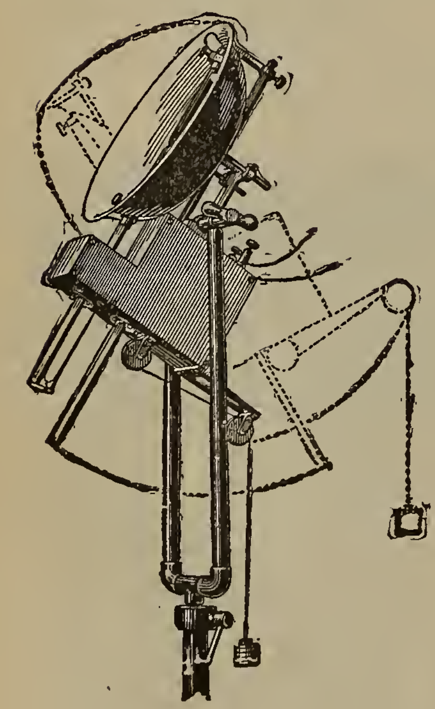

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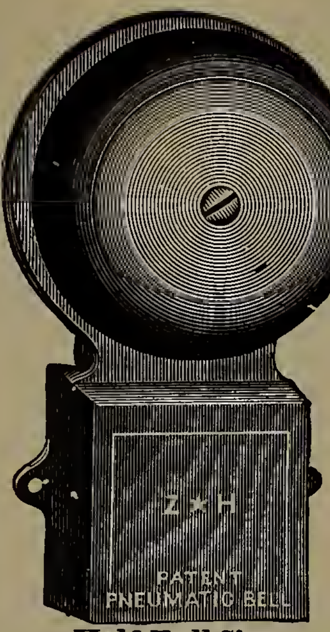

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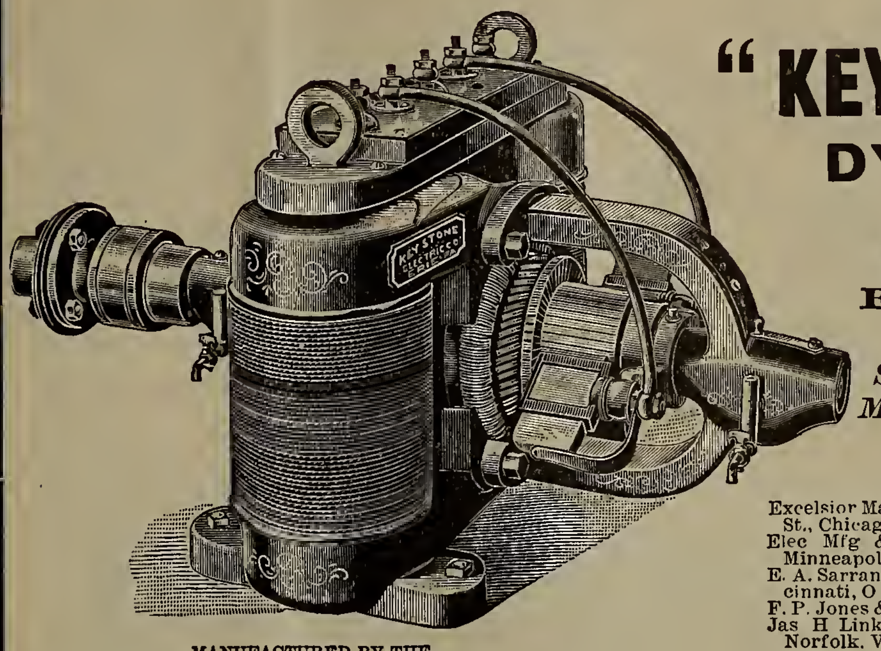

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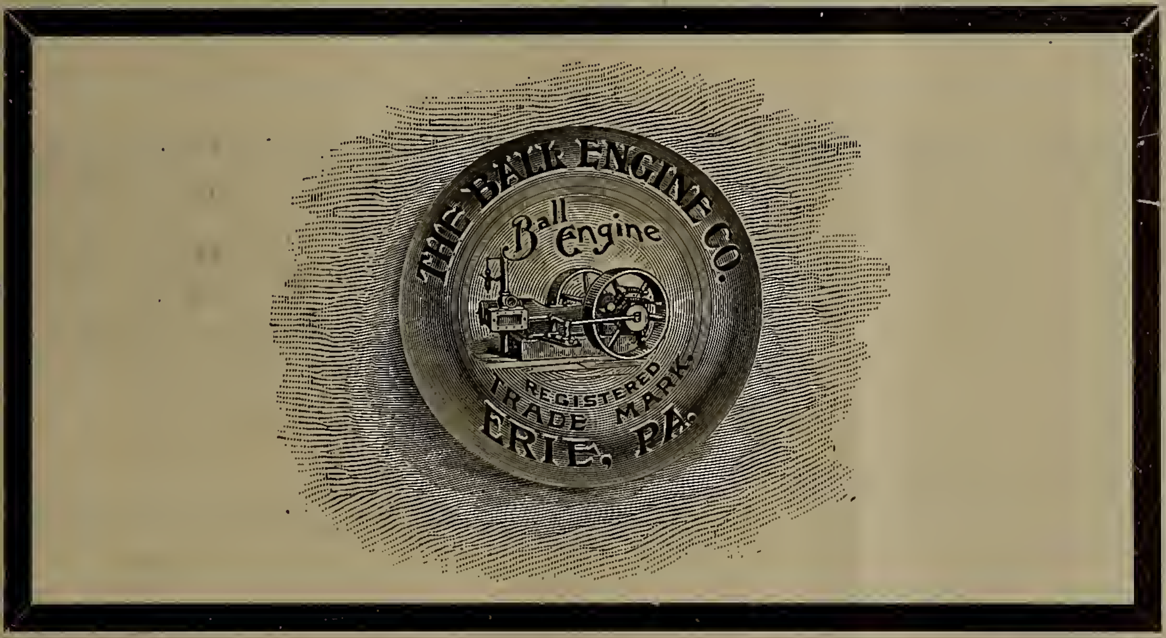
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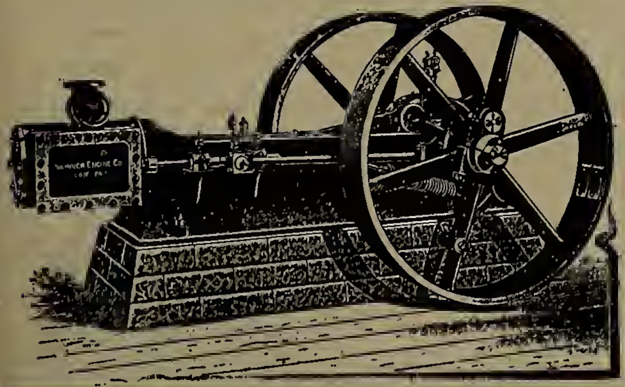

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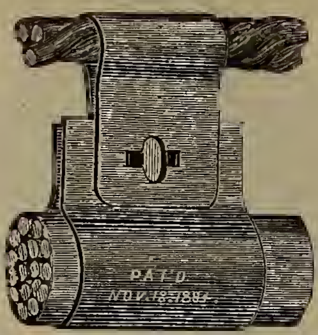

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AN INTERESTING WEEK.

Last week was one of extraordinary interest to the members of the two principal electrical societies in this country, namely, the American Institute of Electrical Engineers and the New York Electrical Society. The former held its annual meeting on Tuesday and Wednesday, and its annual dinner on Tuesday evening. On Thursday, a large number of the members of both societies visited the works of the Crocker-Wheeler Electric Company at Ampere, N. J., and on Friday night, the members of New York Electrical Society and their friends, to the number of 100, visited the performance of "The Seven Ages of our World," by special invitation from the management of the "Urania" theatre.

INCREASING INSURANCE RATES.

The Pittsburg Fire Underwriters, at a meeting in that city on May 5, decided to advance insurance rates, the advance to take effect at once. A heavy increase in the rates on buildings into which electric wires run is made, subject, however, to its being conditionally waived. An increase of 25 cents on the $100 is made where electric light wires run into a building, and 15 cents for each additional wire. These extra charges will be waived, however, if the wires are "fused" at the point of their entrance to the building. The increase on telephone or electric call bell wires is 10 cents on the $100 and 5 cents for each additional wire, the same provisions as to "fusing" applying to the latter class of wires. These increases in electrical risks do not seem to accord with actual conditions. It is a well-known fact that through the great improvements in methods of instaling wires the dangers have been almost entirely removed, and it seems somewhat anomalous to increase the rates on risks in which the element of danger is constantly decreasing, through improvements in methods in wire installation. The electrical people of Pittsburg should use every endeavor to have this rule revoked, as it will naturally tend to frighten timid people, who would otherwise introduce electric lights and other electrical apparatus into their homes and places of business.

PERNICIOUS BILLS KILLED IN COMMITTEE.

In the issues of the ELECTRICAL AGE of April 22 and 29, last, were published articles from Mr. Allen R. Foote on the subject of State supervision and regulation of corporations. Mr. Foote referred specifically to two bills which had been introduced in the legislature of one of the largest and most enlightened States in the Union, for the purpose of regulating and supervising corporations employing natural or artificial gas or electricity for light, heat, or power, or all, to the public, and regulating the price of electric light.

Mr. Foote very ably and completely revealed the unfair and discriminating effects these bills would have upon operating electrical concerns should they become law, and the publicity thus given to these unjust measures has been largely instrumental in compassing their defeat in committee.

We are advised that these bills were thus disposed of, after considerable hard work on the part of those concerns which would have been seriously affected had the bills become law. The bills were very skilfully worded and deceiving on their face, but by reading between the lines and getting at their true inwardness it was seen that they were conceived in selfishness, with the object of crushing certain companies for the benefit of certain others.

PERCUSSION DRILL PLANT.

The electric percussion drill since it was first put into practical operation, has undergone many changes, each tending towards perfection, until today it can compete successfully either with the steam or compressed air drill.

One of the most interesting percussion drill plants is that in operation at the limestone quarries of the Solvay Process Company, near Syracuse, N. Y. This plant has now been working continuously for several months and the excellent results obtained, both in amount of work done by the drills, and the convenience and economy of their operation and maintenance have given thorough satisfaction to the company first undertaking their general employment. Installed by the General Electric Company at the commencement of the past winter, the drills have operated without any interruption from the intense cold, and have practically demonstrated the advantages derivable from the use of electricity in quarry work. Had steam been the only available power, the loss in transmission by condensation at 20° below zero would have been so great that the drills could not have been worked. The quarry, as will be seen from the illustration, is situated in a desolate spot on an elevated plateau, where the intense cold found full scope for action.

VIEW OF QUARRY.

DRILL AT WORK.

At the present time three "Type E," General Electric Company's drills, are in continuous operation ten hours per day, drilling holes from six to ten feet in depth, and 2 to 2½ inches in diameter at the top. The rate of drilling, according to the record kept by the superintendent, is from 45 to 75 feet per ten hours, averaging 50 feet per day, or 1,500 feet per month of 30 days. The average distance of the drills from the power station is about 2,000 feet at the present time, the circuit, three lines of bare No. 0 copper wire, being extended to a distance of 3,000 to 3,500 feet from the power station in one direction.

The manipulation of the drill is in every respect as simple as that of the steam or air drill, stopping and starting being accomplished by merely throwing a handle to the right or to the left, making or breaking the contact between the cable and the terminals of the coils. Not the slightest difficulty is experienced in lubricating the wearing parts, or in handling the drill.

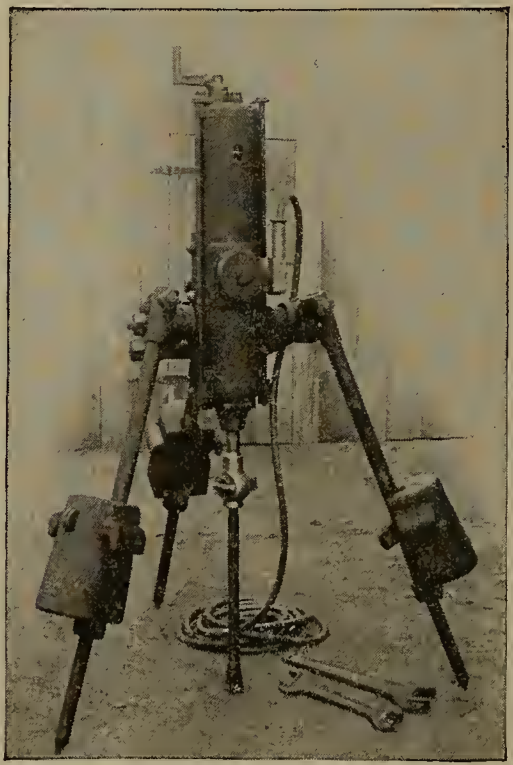
The general dimensions of the "Type E" drills, three of which are doing all the deep hole drilling for the quarry, are:

Length over all	49 inches
Outside diameter, wrought iron tube	7½ "
Length of stroke	5 to 7 "
Blows per minute	380

The generator which supplies the power is of the bipolar type, running at normal speed, and is provided with a device for directing the current alternately into the upper and lower coils of the drills. The difference of potential at the fixed brushes of the generator is 240 to 250 volts.

The generator is belted to a 9''×12'' Straight Line engine, supplied with steam at 90 lbs. pressure from a horizontal tubular boiler, fuel for which is brought for three miles over the cable way in the buckets used to transport the lime rock from the quarry to the works. As yet no estimate of cost or repairs can be given, because up to date there have not been any. Should, however, any part break down, it can instantly be replaced as all the parts are interchangeable.

The plant has aroused widespread interest among quarry operators in general, and has been visited and carefully inspected by many less prone to reject the good things which advanced science offers. That electricity is the ideal power for mine and quarry operation, only the most conservative refuse to believe.



ELECTRIC PERCUSSION DRILL.

Le Mars, Iowa.—The Northwestern Water and Light Company has been incorporated. The company will operate the electric-light and water-works before conducted by J. H. Winchel. The officers of the new company are J. H. Winchel, president; M. W. Richen, vice-president, and J. K. Alline, secretary and treasurer.

A CANINE ELECTRICIAN.

Messrs. Crompton & Co., the well-known electrical engineering firm of London, England, utilize a means of running wires through underground conduits that is novel. It consists of a live fox terrier, by the name of "Strip." Strip thoroughly understands her business, and when a wire or a cord is attached to her collar she knows she must crawl through a conduit and haul the line after her. When she arrives at the opposite end of the conduit workmen are ready to disengage her of her burden.

"STRIP" READY FOR WORK.

Strip, it is said, has laid many miles of underground wires in London, and she gets through the pipes in good time. She is known as "Strip, the Electrician."

A NOVEL APPLICATION OF THE C-S. AUTOMATIC.

The accompanying illustration shows a novel application of the C–S automatic switch, described in a recent issue, wherein it is so arranged as to arbitrarily cut out the current from a hotel guest-chamber by process of locking the door from the outside.

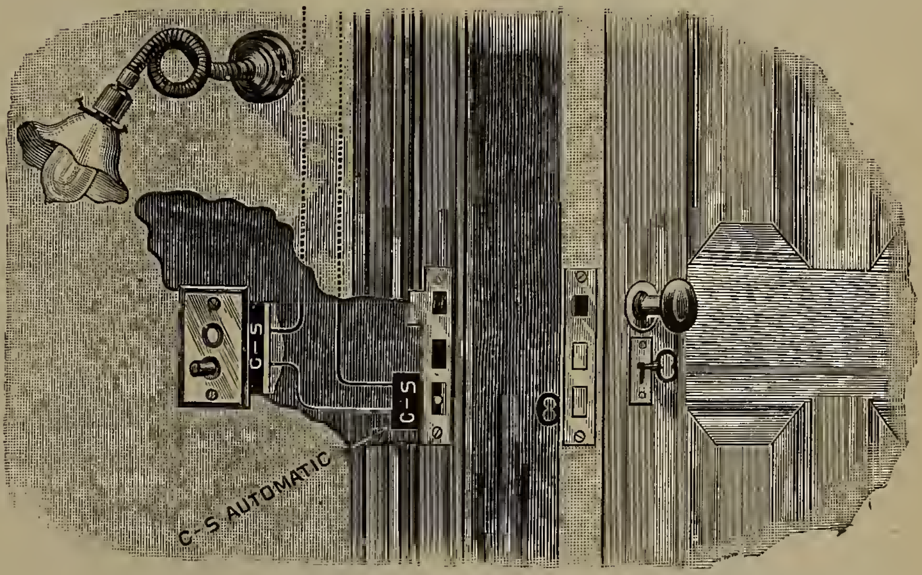
It is probable that no other hotel expense is so greatly augmented by the negligence of guests as is that attendant upon lighting the rooms, and this is particularly the case where the electric light is used. Indeed, it is estimated that ninety per cent. of all hotel guests invariably leave their lights burning upon vacating their rooms.

This evil has become so general, and has proved to be such an immense drain upon business revenue, that hotel managers are constantly trying to devise a remedy, but thus far the only safeguard seems to be to have a constant watch kept upon all the rooms; a method at once expensive and inconvenient. It is the province of this novel application of the "C–S Automatic" to compel the guest to turn off his light upon leaving his room whether it occurs to him to do so or not.

In the modern hotel it is the practice to fit the doors of all guest chambers with the "secret" or double-bolt locks, one bolt being operated from the inside, the other from the outside, and it is by taking advantage of this arrangement that the C–S switch is made to perform this service of economy in a most successful manner.

As is shown in the illustration a "C–S Automatic" is placed in the moulding of the door jamb, immediately back of the striker plate, in such a manner that the push of the switch is directly in line with the movement of the bolt that is operated from the outside of the door. With this arrangement, it will be understood that, when in the process of locking the door from the *outside*, the bolt is thrown, it engages with the switch-push, thus opening the switch and turning off the lights, while locking the door from the *inside* has no effect whatever upon the action of the switch.

However, to provide means whereby the occupant of the room may turn the light off from the inside when desired, an auxiliary switch is placed on the inside of the room, in circuit between the controlling door-lock switch and the lamps, in such manner that while the door remains unlocked upon the outside, the lamps may be turned on or off at will in the usual manner; but whatever the position of this auxiliary switch may be, as to whether the current is off or on; when the occupant locks his door from the outside upon leaving the room the lights are invariably turned off.



AUTOMATIC SWITCH ADAPTED TO CUT OUT CURRENT FROM A HOTEL GUEST CHAMBER.

This unique and valuable device is a recent addition to the well-known line or C–S specialties manufactured by The Cutter Electrical & Mfg. Co., of Philadelphia, and, although comparatively new, they have already been placed in all the rooms of the Great Northern Hotel, Chicago, and other well-known hotels are now being fitted with them.

WORLD'S CONGRESS OF ELECTRICIANS.

We are advised by Prof. Elisha Gray, Chairman of the World's Electrical Congress Committee, that in accordance with the expressed wish of the American Branch of the Advisory Council of the World's Congress of Electricians, the Secretary of State has appointed Prof. H. A. Rowland, Johns Hopkins University, Prof. T. C. Mendenhall, Supt. Standard Weights and Measures, Prof. H. S. Carhart, Michigan University, Prof. Elihu Thomson, Lynn, Mass., and Prof. E. S. Nichols, Cornell University, to sit in the Chamber of Delegates as the duly authorized United States delegates.

While there are many electricians in the United States who could fill, with dignity and credit to the profession, this honorable and responsible position, yet the profession is to be especially congratulated that the United States is to be represented by men of such high standing both as gentlemen and members of the profession.

Prof. Gray also announces that the Royal Commission has named W. H. Preece, Prof. S. P. Thompson, Prof. W. E. Ayrton, Major Cardew and Alexander Siemens as delegates from Great Britain.

There is every reason to believe that the success of the Congress is now assured, and that all the important countries will be fairly represented.

GARTON LIGHTNING ARRESTERS.

The business of making and placing on the market lightning arresters is fast increasing. Electric light and power men consider that it is much better policy to expend a small amount of money and protect their valuable machines, than to save this small sum and to leave the property exposed to damage. The call for these useful appliances has brought forth a great variety of makes.

The Garton lightning arrester has passed successfully through two years of use, and it has been subjected to severe tests, but still holds the record of having never failed. Many roads throughout the country are wholly or partially equipped with this make of arrester. Reports from these roads speak in the highest terms of their successful operation.

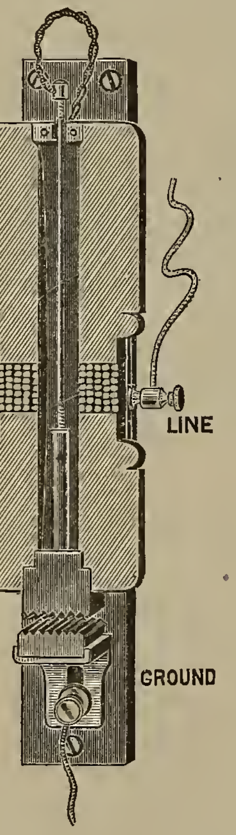


FIG. 1.

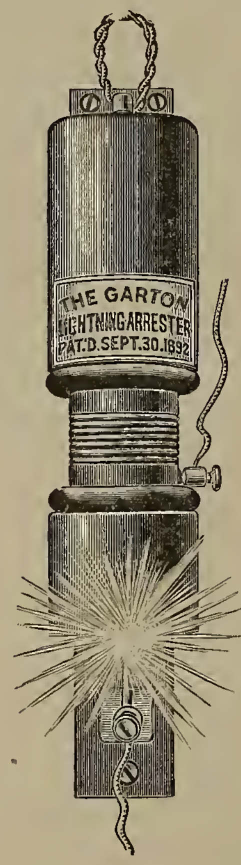

THE GARTON LIGHTNING ARRESTER PAT'D. SEPT. 30. 1892

FIG. 2.

Fig. 1 illustrates a cross section view of the device showing the interior of the air chamber, locality of the carbons, armature and guide rods. The same type of arrester may be used for station, car and pole service. The pole arrester is made with a waterproof covering. In action it is instantaneous, reliable, very quiet, and makes no objectionable fire or smoke.

Jarring or being somewhat out of plumb does not prevent the action of this device.

Fig 2 illustrates the arrester in action.

On one electric road in Ohio, 284 Garton arresters are used, and all through a two days storm recently there was no interruption of traffic, nor was there a cent's worth of damage done by lightning. Another large and important road in the West, with an equipment of 50 arresters, continued in operation all through a recent storm.

Hitherto, under like circumstances, the road had been shut down, but this time not the slightest damage was suffered.

These arresters are used on very many of the Western and Southern roads and in no instance have they failed to arrest lightning discharges.

These excellent arresters are manufactured by the Garton-Daniels Electric Co., Keokuk, Iowa.

THE ACTION OF CONTINUOUS AND ALTERNATING CURRENTS ON FUSE METALS.*

By C. P. Matthews.

For the protection of electric circuits from the passage and consequent heating effects of currents of abnormal intensities, no device is in more general use than the so-called safety-fuse. Commercially the fuse appears in a variety of connecting devices and inclosing boxes, classed as thermal "cut-outs," and familiar to all having to deal with the distribution of electric energy. The protective element in all such consists of a wire or strip of some easily fusible metal of such current carrying capacity that it will melt under the heat developed by an excessive current. In points of simplicity, cheapness, ease of adjustment and low resistance, the safety-fuse possesses advantages over most, if not all, electro-magnetic safety devices. Experience shows, however, that unless certain conditions for successful working are carefully observed, the safety-fuse may fall far short of furnishing satisfactory and reliable protection.

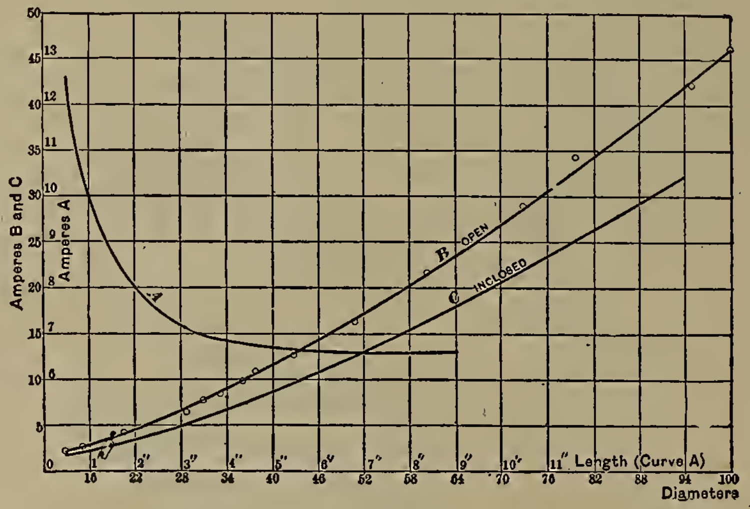


FIG. I.

With a view of studying these conditions, and of obtaining at the same time reliable data on the fusion of conductors under circumstances closely approximating those of actual practice, a series of experiments, some of the results of which appear in this paper, were recently made in the Physical Laboratories at Cornell University.

This experimental work, which was undertaken by several persons, may with propriety be divided as follows:

Part I. On the behavior of various alloys under the action of direct currents, with special reference to their use in thermal cut-outs.

Part II. On the *disintegrating* effect of the alternate current on fuse metals.

PART I.

* * * * * *

To determine to what extent the fusing current is influenced by the cooling effect of the terminals, pieces of wire of given diameter and composition, but of varying lengths were successfully tested. The marked variation in current is shown graphically in Fig 1, Curve A. It will be noted that while an 8 in. piece fused at 6.6 amperes, a ½ in. piece of the same wire carried 12.5 amperes, or an excess of nearly 100 per cent. before yielding. For lengths of this wire greater than 6 in. the conduction losses are practically nil in their influence on the value of the fusing current. The practical point to be observed at this juncture would seem to be this: manufacturers cannot accurately rate their fuse wire unless the length of the specimen to be used is specified. In the fuse-blocks in common use it is impracticable to use extreme lengths, yet if 3 inch pieces were used, the cooling effect would not be serious. Fuse-blocks are on the market employing from ½ inch to 3 inch lengths of wire and all the variation indicated by the curve may be expected.

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* An abstract of two theses, viz.: "Safety-fuses for Electric Circuits," by J. S. Peck and C. P. Matthews; and "The Action of Alternating Currents on Fuses," by W. S. Rugg and C. R. Sturdevant, read at the Tenth General Meeting of the American Institute of Electrical Engineers, New York, May 17, 1893.

There is an important *time element* to be considered in connection with the phenomena of fusion. A certain interval elapses before the wire reaches the permanent temperature corresponding to a definite current. The duration of the current in this portion of the work was 60 seconds, experience showing that if a wire of moderate diameter did not fuse in that time under the action of a certain current it would not fuse at all. Curves A′ and B′ of Fig. 3 illustrate the magnitude of this effect in a particular case, the time intervals being as 1:2. The variation in fusing current exceeds 5 amperes for the larger sizes. It should be noted in this connection, that unless massive terminals are used they may themselves become heated, thereby checking the flow of heat through the ends of the wire, and tending to promote ultimate fusion.

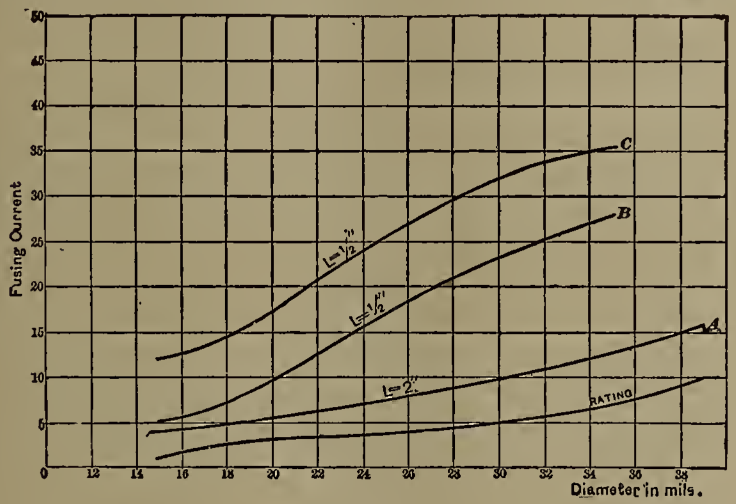

FIG. 2.

Curve C, Fig. 1, illustrates the effect of enclosing the fusible wire in glass tubes. As would be expected, the convection is thereby checked, and the fusing current very appreciably lowered. This is a point which should not be overlooked in practice, that is to say, the nature of the fuse-block, whether closed or open, should be considered.

In order to ascertain the status of marketable fuse-wire, a number of samples were obtained from different manufacturers and tested under conditions similar to those already described. The results were represented graphically by curves, only two sets of which are here reproduced. In Fig. 2 curve A is that obtained where 2 inch specimens were tested, and, as will be seen, is not far from a $\frac{3}{2}$ power curve. When, however, ½ in. pieces of the same wire were tested, curve B, much higher and distorted, was obtained. The marked cooling effect of the terminals is here apparent. Curve C is the most remarkable of all. One-half inch lengths of the same sizes of wire were successively fused in a porcelain ceiling cut-out block. This block was so constructed that the wire came in contact throughout its length with the cooling surface of the porcelain. The heat was conducted away so rapidly that the current reached the abnormal values shown, before rupture occurred. For example, a 7-ampere fuse did not "blow" until more than 35 amperes were flowing in the circuit. Curve A′ B′ and C′ in Fig. 3 represent the behavior of the best sample of wire tested. The wire was quite uniform in diameter, and gave evidence of careful rating. The curve of rating should be of the same general equation as that of fusion, since both represent isothermal conditions.

The requirements for an efficient safety-fuse may be summed up as follows.

1. Promptness of action.
2. Low fusing point.
3. Permanency under normal conditions.
4. Moderately low resistance.
5. Firm and lasting contact.

Promptness of action requires that the temperature of fusion should not be too far removed from that attained when the wire is being worked at its rated capacity. Moreover, it is important that the metal should not undergo chemical changes produced by the action of the heat which may appreciably alter its melting point. The formation of oxides may or may not promote prompt fusion. In the case of pure tin and some of its alloys, a coating of oxide is often formed which retains the molten metal some time after the temperature of fusion has been passed, ultimate rupture usually occurring with considerable violence. On the contrary, the rapid oxidation of iron and copper wires seems to favor prompt fusion.

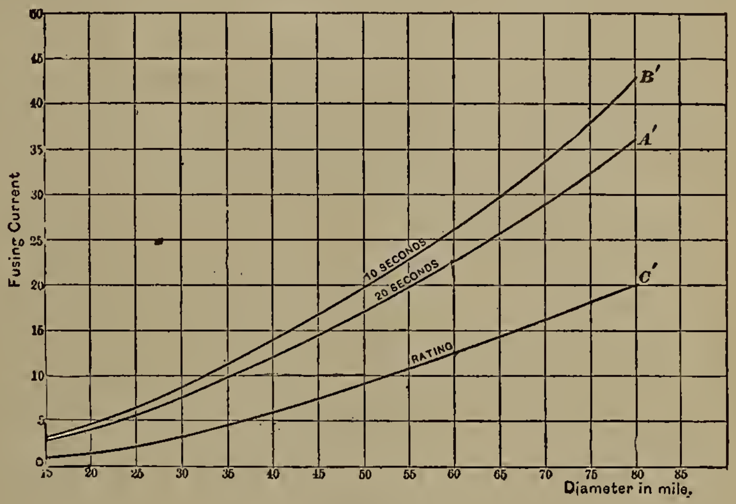

FIG. 3.

The question of low fusing point is one with which the fire underwriters are concerned, since wires fusing at high temperatures introduce an element of danger from fire. With fuses enclosed in properly constructed blocks, the danger from this source is not great, and the necessity of employing a metal of low melting point is not so important as might be imagined. Experience shows that fuses made of nearly all the metals available for such purpose, will melt without dangerous scattering of particles or liberation of hot gases, when the current is gradually increased until the break occurs. This, however, is a condition which rarely obtains in practice. (*To be Continued.*)

The General Electric Company reports the following western contracts: Mission street road, San Francisco, forty cars, twenty equipped with two 25-H. P. motors each and the others with single truck and two 20-H. P. motors each; also six 200-K. W. generators for the power station; four cars for the San Jose and Santa Clara railroad; three double 15-H. P. motor equipments and one single 15-H. P. motor; also five cars, double 25-H. P. equipments for the Metropolitan road, of San Francisco; two double equipment cars for the Telegraph avenue line, of Oakland; five large double equipment cars for the Haywards road.

OFFICIAL BADGE OF THE A. I. E. E.

The accompanying illustration shows the design of the official badge adopted by the American Institute of Electrical Engineers.

The badge embodies the following characteristics:

Franklin's kite which demonstrated the identity between lightning and electricity and represents static electricity. It is a recognition of America's first electrician and philosopher, Benjamin Franklin.

A diagramatic representation of Wheatstone's Bridge, one of the most important pieces of electrical testing apparatus.

The galvanometer, another equally important piece of testing apparatus and which represents magnetism and induction.

The amber of which the galvanometer is made represents the first conception of electricity dating back to 600 years B. C., when Thales, the Greek philosopher, recorded the fact that amber, when rubbed, attracted light particles to it, and the Greeks worshipped it, believing the Gods had endowed it with life and that it possessed a soul.

In 1600 A. D., Dr. Gilbert, court physician to Queen Elizabeth, coined the word electricity from the word electron, the Greek name for amber.

A. I. E. E. represent the initials of the American Institute of Electrical Engineers.

$C = \frac{E}{R}$ represents Ohm's law—a fundamental law in electrical work.

The pin is made of white enamel with the lettering and front portions in 18 karat gold and the back in 14 karat gold.

Members desiring to secure one of these pins should apply to the secretary, Mr. Ralph W. Pope, 12 West 31st street, New York city.

ELECTRICAL STANDARD-UNITS.

INTERNATIONALLY PROPOSED AND CONTROVERTED FROM A SCIENTIFIC AND PRACTICAL STANDPOINT.

By F. M. F. Cazin.

In August, 1892, the British Association for the Advancement of Science, held a meeting at Edinburg, Scotland, and under its patronage there was held an international consultation on the subject of electrical measurement, in which the following savants took part:

Dr. von Helmholtz, president of the "Physikalisch-Technische Reichsaustalt" at Berlin, Germany.

Dr. Lindeck, and Dr. Kahle, his assistants.

Major Cardew, representing the British Board of Trade.

All the members of the committee on electrical standards of the British Association for the Advancement of Science.

Dr. Guillaume, member of the "French Bureau International des poids et mesures," of Paris.

Prof. Carhart, of the University of Ann Arbor, Mich., U. S. A.

In this consultation all previous propositions for electrical standards were revised, mainly on propositions made by Dr. Helmholtz, and standards modified in sundry points from those previously recommended, were unanimously accepted, with a view of prevailing on the governments of the several nations represented to issue laws for an obligatory introduction of the standards thus accepted, the same as these nations had made laws to establish a yard, a foot, a metre, a pound, and a gram.

The issue of May 5, 1893, of the *Electrotechnische Zeitschrift* has published in an official report of the "Kuratorium der Physikalisch-Technischen Reichsaustalt on the consultation as hereabove mentioned and a German version of the propositions as they are intended to be sanctioned by law.

In relation to the theoretical units—

(1) for distance of 10^9 cm.
(2) for mass of 10^{-11} gm.
(3) for time of 1 second.

The report says:

"These theoretical definitions of fundamental electrical units have been omitted in the propositions for a determination by law of electrical units, because it was assumed, that they only belonged to the reasoning out of the selection made of the practical units;" and further, "the same as the law declares the length of a stated rod as the unit of measuring distance without referring to the assumption of its representing the ten-millionth part of the quadrant of the earth, a precise definition of practical electrical units only has been proposed, without referring to their theoretical deduction;" and further, "the practical establishment of these (theoretical) units on the basis of their theoretical definitions causes difficulties."

It all amounts to this, that for the measurement of electrical potential energy these savants accepted from mechanics the unit of time only—the second, while for distance and weight, they propose a multiple for the one and a fraction for the other of the metre and of the therefrom deduced volume of water and its weight. But they omit altogether to make connection with the measurement of other modifications of energy, such as gravitation, heat and chemical affinity. And yet in their definitions of the electric current unit, the ampere, they draw on the sciences of chemistry, and indirectly of heat, as elements in such definition, thus abandoning their own theoretical and fundamental definitions entirely in the practical definition of the ampere, which more properly might be called the transverse dimension of the potential electric jet.

Unconcerned as to the fact, whether nature in her fundamental laws works in numbers, that present themselves as a product of two in three or two in five, that is, whether the decimal, the Latin arithmetical system, or the duo-decimal, the almost forgotten Saxon system, complies more closely with the phenomena of nature, these savants cause decimals to be fundamental to their values. If faults there be in this, the position taken by me in my essay headed: "Mechanical power the only true standard to measure electric energy by," of considering 100,000 amperes as equivalent inversly to the combustion with one-half of a chemical equivalent of oxygen, is sharing in this fault or defect in common with all scientists of this age. And as long as the metre remains the unit of distance for all scientists of progressive tendencies, and as long as neither the value $g/2$, nor the length of a lightray-wave has become the unit for measuring distance and as long as public schools teach arithmetic in the decimal and not in the duo-decimal system, so long will such a use of decimals remain justified.

In all of the resolutions passed the definition of the watt as $1 \text{ watt} = \frac{1}{g}$ kilogram-meter second is ignored, and yet is the watt or volt-ampere acknowledged as the unit of mechanical work performed by electrical energy. $\frac{1}{g}$ kgm-m second is a unit of measuring the equivalent of mechanical work without reference to local gravitation, or as auniversal unit of work, and as such is accepted more universally at this date, by scientists of all tribes and schools, than as yet any one of those units as proposed by the learned savants above named. By it alone connection may be made for measuring equivalents of electric, chemical, mechanical and heat modifications, which again is rendered impossible almost, by the employment and experimental results of such arbitrary fundamental assumptions as 10^9 cm. and 10^{11} gms. from which an experimental chemical or mechanical effect has been evolved in a manner not intelligible to the common mortal though otherwise able to conceive the features of scientific determination, by which dia-chemical effect is represented by the energy equation of

$$Q\,(+) = 111.8 \times 0.00001 \text{ of silver}$$

for the cathion quantity per second in a single case, as proposed to be made a law, and against the general energy equation as by me proposed relative to all matters elementary and to all of their compounds as known in science, viz.:

$$Q\,(+) = \frac{A\,W\,P \times C^{P}}{2 \times C^{N}} \times 0.00001$$

(Compare the Electrical Age of May 20, and the *Electrical World* "Electro-Metallurgy," June 4, and July 28, 1892). Although, aside from my own proposition thus made, no other expressed in definite terms and values, has so far been made on the part of any other scientist, I do not at this time stand alone in opposition to the regulation by law at the present date of electric units under the proposition made by the parties so far consulted.

Hospitalier in the issue of April 25, of "L' Ingenieur Electric" takes the same position; and the London *Electrical Review*, April 28, states that Prof. Ostwald, in a communication to the Munich Academy. recommends the substitution of the unit of energy for the unit of mass as one of the three fundamental units of an absolute system, in which case all physical magnitudes would be expressed in energy, length and time. Energy is the only magnitude which is common to all branches of physics, and it forms the single bond which unites the theories of heat, electricity, chemistry and dynamics.

Such a recommendation is carried out in accepting as by me proposed the equation

$$\frac{1}{g}\ \text{Kgm-m} = 1 \text{ Watt}$$

as fundamental.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The annual meeting and election of the American Institute of Electrical Engineers took place at the Institute headquarters, Tuesday, May 16, 1893, at four o'clock. Prof. Edwin J. Houston was unanimously elected president for the ensuing year. The other officers elected to fill the vacancies caused by the retirement of some of last year's officials are: Vice Presidents, H. Ward Leonard, P. B. Delany and William Wallace; Managers, Charles Hewitt, W. J. Hammer, Harris J. Ryan, J. J. Carty; Treasurer, Geo. M. Phelps.

The report of Council for the year ending April 30, 1893, was read and approved. At the meetings held during the last year thirty papers and reports were read and discussed and have since been printed and distributed to the members. The volume of transactions for 1892 was one-third larger than that of the previous year. It contained 858 pages. Two rooms in the Electricity Building at the World's Fair have been assigned to the Institute for use as headquarters, and satisfactory progress is being made in the suibtale equipment of these rooms. The Institute has done much in assisting in the preparation for the World's Electrical Congress of 1893. The various papers and discussions are now published at an earlier date than in previous years. A badge and certificate of membership have been approved. A description of the badge will be found on another page. The loss in membership of the Institute by death has been unusually large, the total being 9. The present membership is 671 (a net gain of 56) classified as follows:

Honorary Members	3
Members	206
Associate Members	462
	671

The Treasurer's report shows a balance on hand, General Fund, May 1, 1893, of $90.90. Building Fund, $850.00.

After the business meeting the members attended the annual banquet held at "The Arena" 41 West 31st street. Members and friends to the number of seventy-five sat around the board and enjoyed the following menu.

MENU
Little Neck Clams
Clear Green Turtle Soup
Olives Radishes
Salmon à la Hollandaise
Potatoes á la Duchesse
Filet de Bœuf piqué aux champignons
Green Peas Haricots Verts
Coquilles of Sweetbreads, Lucullus
Roman Punch
Roast Squab
Lettuce and Tomato Salad
Tutti Frutti Ice Cream
Assorted Fruit
Cheese
Café Noir.

Informal speaking followed the banquet. President Houston made a short address and called upon Mr. Frank J. Sprague to act as toastmaster. The electrical history and progress of the past seventeen years was ably outlined by Mr. T. D. Lockwood. A telegram was sent to Prof. Elisha Gray, Highland Park, Ill., expressing the appreciation of the members present of the earnest work done by this gentleman in establishing the World's Electrical Congress and promising hearty co-operation. Mr. Frankland Jannus gave a short humorous account of early electric railway installations, and was followed by Dr. C. E. Emery, who called attention to the vast field for exploration in the study and investigation of the force known as gravitation.

The subject of measuring instruments was well discussed by Mr. E. G. Willyoung. He stated that the electrical measuring instruments made in this country had reached a high state of perfection. Mr. T. C. Martin, the last speaker, made an enthusiastic speech on "The Society." He gave some of the early history of the Institute and spoke of its hopes with regard to the future.

NEW YORK ELECTRICAL SOCIETY.

The society held its 153rd meeting at Columbia College, on the evening of Wednesday, May 17, 1893. Dr. William J. Morton delivered an extremely interesting and instructive lecture entitled "A Brief Glance at Electricity in Medicine." The subject was treated under the following heads: Section I. The various currents used in medicine. Section II. The properties and applications of the respective currents. Section III. High frequency; high potential currents; electro-statics or Franklinism. *A.* Tesla currents, from alternators, air-gap, and condensers and induction coil; *B.* Morton currents from influence machine, air-gap and condensers; *C.* D'Arsonval currents; Sinusoidal currents from alternating dynamo machines. The lecture was illustrated by experiments with a large static machine, and a large modern medical electrical battery and coil were also shown. The lecturer stated that the human tissue was affected in several ways by the electric current. One of the chief effects is of a chemical nature, the action being allied to that set up in a voltaic cell. The physiological effects are very noticeable and seem to depend on the high potential and instantaneousness of the electric shock. The light, vibratory and heating properties of the electric currents are used in electro-therapeutics. The conductivity of the body is largely caused by the salts which are contained in it and the different tissues of the body vary widely as to their conducting power. The human body may be used as a storage battery. A person can be highly charged by electricity, and on removing the wires, and the terminals of an incandescent lamp placed on the body, the lamp becomes illuminated The action of the current on animal tissue seems to have a lasting effect. To one leg of a frog an electric current was applied; some time afterward currents were applied to both of the legs; the leg first operated on was found to be much less susceptible to the action of the current, than the leg not previously charged. Needles suitably connected up are placed in the human body to gather or scatter chemical or metallic matter, in relation to the point of application. The property of an electric current in carrying liquid from the + pole to the — pole is of great service in the practice of medicine.

Medicines can thus be applied to special localities of the body; for instance, a person may place one foot in a positive bath and with the hands grasp the negative pole. The physiological effects are contraction of the muscles, rigidity and heating. The heart contracts by a steady continuous current, and most of the other muscles, such as the biceps, triceps, etc., contract to an intermittent current. In applying the poles of the medical apparatus, the + pole is presented if a passive effect is desired, the — pole if an active.

Modern electro-therapeutics is much different from the old, inexact method of medical electricity. A person can now take a very severe shock, and yet at the same time feel little or no pain. When the patient is on an insulated stool, the positive lead is usually attached to the body.

"Electrocution" is supposed by an eminent authority on electro-therapeutics to be an unconscious but not a lifeless state, and that with proper restoratives the person "electrocuted" may be brought to life. With 2,500 to 5,000 vibrations or impulses of electric current the physiological effects are at their maximum; at 5,000 and above the effect is much less apparent and the pain is greatly decreased.

The lecturer in closing showed the similar paths in which the science of medical electricity and electrical engineering run harmoniously together.

MINERAL RESOURCES OF THE U. S.

According to "Mineral Resources of the United States" for the calendar year 1891, just issued by the United States Geological Survey, Department of the Interior, the total production of copper during that period was 295,810,076 pounds, against 265,115,133 pounds the previous year. Its value in New York is placed at $38,455,300. This is the largest production on record, the increase coming from Lake Superior, Arizona and California. The stock of copper in the United States declined.

The total product of zinc during 1891 was 80,337 short tons against 63,683 short tons in 1890. Its value was $8,033,700. Nearly every important producer shows an increased output. The output of quicksilver was practically the same as that in 1890, California being the only producing State.

In 1891, 100,000 pounds of aluminum were produced against 47,881 in 1890, The demand for this metal for experimental purposes increases. The value of the product for 1891 is fixed at $100,000. The chapter on aluminum was written by Mr. R. L. Packard and contains some interesting facts and figures. The American product of this metal was far surpassed in quantity by foreign output. In Germany it is put to a great variety of practical uses, while in this country its application to every day purposes is rapidly extending. Sections of the chapter are devoted to the consideration of the metallurgical uses of the metal, soldering and alloys.

ANNUAL REPORT OF THE WESTINGHOUSE COMPANY.

The following is a copy of the annual report of the Westinghouse Electric and Manufacturing Company, which was received too late for our last issue:

OFFICE OF WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.

PITTSBURG, PA., May 17, 1893.

To the Stockholders of the Westinghouse Electric and Manufacturing Co.:

Your Board presents herewith its financial statement forthe year ending March 31, 1893.

It will be seen that there has been a profit from manufacturing of $1,491,817.13, and from other sources of $112,766 60, making a total for the year of $1,604,583.73. This is after charging to operating expenses the following amounts: $84,747.31 for alterations and additions to buildings; $155,484.87 for maintaining the machinery and tools in the highest order, and $58,188.86 for interest and discount.

The year began with large orders, but with only a moderate manufacturing capacity and a proportionate stock of material on hand, so that the above earnings were made under unfavorable circumstances due to the fact that the capacity of the works and the material in stock and in process had to be more than doubled during a steadily increasing press of business.

During the year the Company has manufactured and installed, at the World's Fair in Chicago, an electric lighting and power plant, consisting of twelve generators of 15,000 lights capacity each—two of 4,000 lights capacity each; one 750 horse-power generator, and several small ones. Six of the large generators are driven by engines having their shafts connected directly to those of the generators. This plant is the largest ever installed.

These generators mark a new era in electric light and power distribution. They are of the "two-phase" type, designed to drive Tesla motors, and at the same time to operate both arc and incandescent lamps, thus making the one form of generator useful for three purposes.

The total capacity of the plant exceeds the contract requirements sufficiently to meet the demands that may be made by exhibitors for extra lights.

The Company will also have at the Fair an extensive exhibit of its other forms of apparatus.

The stopper lamps now being manufactured in the company's Allegheny City works are being used exclusively in connection with the apparatus at the World's Fair. It is gratifying to be able to announce that in the manufacture of the Sawyer-Man stopper lamps, all of the advantages anticipated have been fully realized. The low cost of manufacture, and the high efficiency of these lamps, together with the ability to renew their carbon burners, enables the company to sell lamps at lower prices than can be afforded by any other manufacturer. To meet the demand, a new factory has been equipped with special machinery designed for the purpose, and already has a daily capacity of 5,000 lamps, which is being rapidly increased, and will be shortly quadrupled. The expenses incident to the establishment of this new lamp factory have been charged to the business of the past year. This branch will hereafter add materially to the volume and profit of the company's business.

The success of the stopper lamp, its low cost of manufacture, and the fact that it is the discovery, prior to Edison's patents of inventors whose patents belong to our company, have turned a temporary check into a great business advantage.

Our competitors have copied our plans and infringed many of our patents, notably those relating to power-transmission, and many important details essential to the successful operation of alternating current apparatus for the distribution of electricity for light and power purposes, for which we have brought suits for infringement.

The confidence expressed in the last annual report, in the superior merit of the apparatus of the Company, and in the strength and value of its patents, has been fully justified by the results of the year's operation; and we feel no apprehension as to the outcome of suits now pending or which may be brought by its competitors.

Your directors have been brought face to face with the fact that the business of the Company has outgrown the present capacity of its factories, and that large savings could be effected if the manufacute were carried on in new works equipped with the latest devices for handling its product by machinery.

In view of the favorable result of the past year's business, and of the volume of orders in hand, and the future outlook, your directors have not hesitated to accept a proposition from the East Pittsburg Improvement Company to sell to your Company a site of 23 acres most favorably located with reference to railway facilities. The Improvement Company has agreed to erect on this site buildings and works according to the plans and under the supervision of the officers of your Company, and to sell them to the Company at their actual cost, not, however, to exceed $500,000 above the price of the land and have agreed to take pay therefor in quarterly payments of $25,000 and interest beginning January 1st, 1894. Your officers have estimated that the savings to be effected by the manufacture of its products in the new works, will, on a most conservative basis, be more than double the amount of the quarterly payments. Thus, these new and complete works will be acquired without the expenditure of fresh capital, leaving the proceeds from the sale of the Company's present property, as working capital, without taking into account the manifold business advantages that will arise from the centralization of its manufacturing operations.

The results of the past year's business have shown that our apparatus can be sold for cash to responsible parties, and that the prevailing belief that long credits must be given, or that stocks and bonds must necessarily be taken in order to secure business, is not correct. Your officers and agents have found that low cash prices and good apparatus are sufficient inducements to secure all the trade the Company can care for.

Although the profits of the business might have justified the payment of dividends on all of the stock of the Company, the directors have thought it wise to pursue a very conservative policy, especially in view of the large expenditures required during the past year for machinery and material, and of similar expenditures which the present prosperous condition of the Company's business may make necessary in the near future. Both the results and the prospects are so encouraging that the directors believe the stockholders will uphold them in a course which places the Company in a position of undoubted financial strength, and which will assure the permanent continuance of dividends when once begun.

It will interest the stockholders to know that there has been a large increase in the orders for electric lighting machinery. The orders on hand, with those received since April 1, the beginning of our fiscal year, aggregate $3,028,048.32, about double the figures at the same date last year. The orders in hand, the current business, and the outlook justify the expectation that the business for the present year will be largely in excess of last year. The company has turned out its products during the past three months at the rate of over $8,000,000 per annum, and now has on its pay rolls 3,942 operatives.

For the Board,
George Westinghouse, Jr.,
President.

BALANCE SHEET, MARCH 31, 1893.

ASSETS.

Cash in Banks	$212,573 85
Bills receivable	366,228 47
Accounts receivable	2,289,982 70
Material in stock and in process of manufacture (at a cost of labor and material)	1,414,662 31
Advances to leased companies	138,573 06
Bonds (par value $369,100)	358,197 15
Stocks (par value $6,469,257)	4,069,439 96
Real Estate and Buildings	453,037 98
Machinery and Tools	710,023 61
Miscellaneous	60,055 54
Charters, Franchises, Patents, etc	4,378,031 69
Total Assets	$14,450,806 32

LIABILITIES.

Accounts payable			$569,660 48
Bills payable, issued for Merchandise			376,003 64
Discounted with collateral			931,884 51
CONTRACT AND CONTINGENT LIABILITIES.			
Scrip Dividend			194,562 00
Stock Subscriptions			13,125 00
U. S. E. Ltg. Co.'s 6 per cent. 15 year bonds, $50,000 payable annually			600,000 00
(Bills receivable under discount, $482,054 49.)			
CAPITAL STOCK.			
Preferred, 37,378 shares		$3 668,940 50	
Assenting, 103.146 shares		5,157,331 00	
Common, 3,633 shares		181,650 00	9,007,921 50
(In Treasury, 6,621 shares Preferred; 13 220 shares Assenting.)			
SURPLUS.			
Balance, March 31, 1892		$1,880,445 20	
Twelve months' net earnings from business	$1,491,817 13		
From other sources	112,766 60	1,604,583 73	
		$3,485,028 93	
Less amount written off in adjustment of matters pending in 1890 and 1891	$321,228 05		
Ditto in current year	98,869 65	$420,097 70	
		$3,064,931 23	
Interest on Bonds	39,000 00		
Interest on Scrip	11,673 72		
Dividends	256,608 32	307,282 04	
			2,757,649 19
			$14,450,806 32

The old board of directors was re-elected.

PERSONAL.

Mr. Horatio A. Foster, the well-known electrical expert, is now engaged on the editorial staff of *Electrical Industries*, Chicago.

COMBINATION STREET CARS.

When a system, as a whole, makes rapid strides in advancement, the individual and dependent parts have to keep up the pace. In fact the improvement of the parts raises the value of the whole system. The street railway business of today is very much sub-divided. On one railroad may be gathered material and appliances that were manufactured in widely separated portions of the country. It is by the independent advancement of these allied industries that the street railroad of today has reached its present condition and it will be due to the same movement that the more perfect railroad of the future will be brought forth. Along this line of progress is the increasing beauty and comfort of the modern street car.

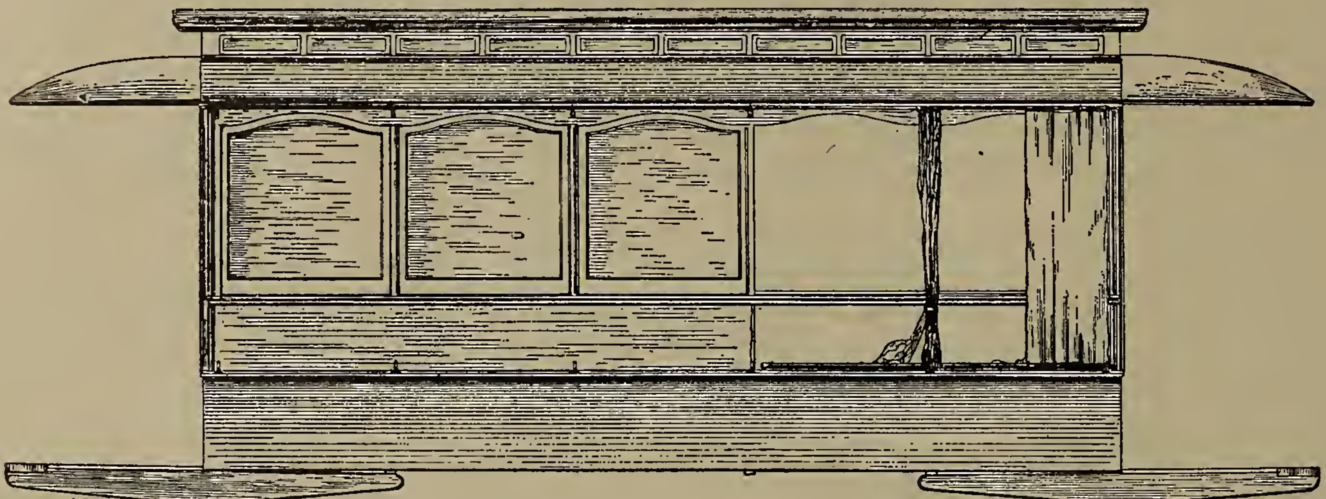

FIG. 1—SIDE VIEW OF COMBINATION CAR BODY.

A new combination street-car has recently been invented by J. P. Sjoberg & Co., 155 and 157 Eleventh ave., New York city. This car is one that is so constructed that it may with ease be transformed from a summer to a winter car or vice-versa. It is of reliable and convenient construction, so arranged that it will seat 24 people facing forward in a car body 16 feet long. An aisle passes through the centre of the car. By the use of combination cars the cost of car storage and fire risks on idle rolling stock is done away with. As the cars are used throughout the year the change of motors twice a year from one set of trucks to another is rendered unnecessary. A less number of cars is needed for a given population and therefore the interest on the rolling stock is low.

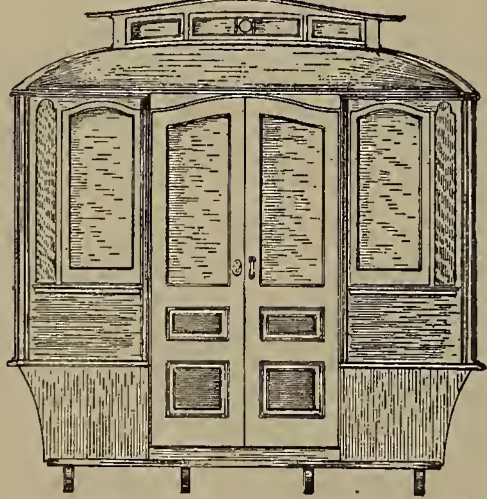

FIG. 2—END VIEW OF CAR BODY.

Figs. 1 and 2 illustrate the side and end views of this car.

J. P. Sjoberg & Co., have every facility for handling their work, the latest wood-working machinery being used in their factory.

THE LOVE UNDERGROUND SYSTEM.

The Love Electric Traction Company is meeting with success in the operation of the Love underground trolley system. Cars can be equipped for use with both the overhead trolley and the Love system, the necessary operations for transferring from one system to another, takes but a few seconds. The system is in very successful operation by the Rock Creek Railway Company, Washington, D. C.

Under date of May 17, Mr. M. D. Law, the electrical engineer of the Love Company, who is supervising the work on this road, writes us from Washington as follows:

"I must say that in all of my experience in starting electric plants I have never started one that went off as smoothly as this. We have had no trouble of any kind. Last Saturday we had a very severe rain, or rather cloud burst, which at two points completely submerged our tracks, but the cars kept on through it all without any delay, nor could any loss of current be detected. There is no question but that in large cities the underground trolley will have to be used and so far the Love system has the lead, and I don't think it will have any trouble in keeping it."

The company's headquarters are 817 Rookery, Chicago.

MILITARY MORSE CODE OF SIGNALS.

On the night of May 10 the New York First Brigade Signal Corps and the Brooklyn Second Brigade Signal Corps held a contest in military signaling, at the 13th Regiment Armory in Brooklyn.

The message on which the test was made consisted of one hundred letters. It was transmitted from the first to the second station by wire, from the second to third by flags, and from the third to the fourth by flash light. Twelve men were selected from each corps for the competition.

Brooklyn began the contest. At the first telegraph instrument were two signal men. One of them read the message that had been selected and the other telegraphed it to the second, where there were three men waiting for it. One man received it from the wire and the other two wigwagged it to station 3. Wigwagging is simply indicating the dots and dashes by a code of flag signals. At station 3 were three more signal men. Two of them received the message and transmitted it to the third man, who sent it to station 4 by flash light. At this last station one signal man read the flash light message and repeated it to another signal man, who wrote it down. Then the message as received was compared with the message as sent from station 1. Accuracy and time were the points considered.

The Brooklyn men won on time, the work of each of contesting corps being perfect. Mr. Charles A. Tinker, general superintendent of the Western Union Telegraph Company acted as referee. The time of the Brooklyn men was 4 minutes and 23 seconds and that of the New York corps 4 minutes 58 seconds.

VISIT TO THE CROCKER-WHEELER NEW WORKS.

About eighty members of the American Institute of Electrical Engineers and New York Electrical Society, on the afternoon of Thursday last, May 18, on the invitation of the Crocker-Wheeler Electric Company, visited the extensive works of that company, at Ampere, N. J. Two special cars were attached to the 2.10 P. M. train on the Delaware, Lackawanna and Western Railroad, for the accommodation of the guests, and the run of eleven miles was a pleasant one. Arriving at Ampere, which station, by the way, is directly opposite the Crocker-Wheeler works, on the west side of the tracks, the party were at once taken through the various buildings and very carefully inspected the system of power distribution. They also watched the work on the different parts of the motors and generators with evident deep interest, and the general sentiment seemed to be that the Crocker-Wheeler Company had taken a large stride forward in the matter of the practical application of electric power for manufacturing purposes, and that the initiative having been taken this method of applying power would come into general use.

The works are full of interest to the mechanical engineer as well as to the electrical engineer. The most prominent feature of the plant is the almost entire absence of shafting and belting, the various machines being operated directly by electric motors. In place of shafting we find bare copper conductors stretched along the roof beams, which are readily accessible for connection at any point wherever it is desired to place a machine tool. A lathe, drill or any other like piece of machinery may be placed anywhere about the shop, and the power to operate the same supplied by simply connecting the machine with the main conductors by two wires. This method of applying power, it will be readily seen, is remarkable for its flexibility. No expensive shafting is necessary, and the machines may be placed anywhere without reference to shafting. At any point in the shops electric power is always on tap. The power is distributed on the three wire system.

In the testing department a large number of motors of all sizes are seen, some idle, awaiting shipment, and others being subjected to the thorough tests which are applied to all the motors made by this company. There were also a large number of direct current transformers, or dynamotors. Some of them are intended to transform direct currents from one voltage to another, while others are designed to convert direct currents into alternating currents. These latter machines are for use in telephone exchanges, for bell ringing purposes. The company is now at work filling orders for machines of this description for the telephone exchange at the World's Fair. Arc motors in large numbers were also being tested.

For obvious reasons the temperature of the testing room is kept as nearly as possible at 70°. This is accomplished by the use of Sturtevant heaters. The fresh air from out doors is brought into contact with large steam pipe radiators and the air thus heated is forced through galvanized iron ducts having outlets at various points along their length. These ducts or pipes are placed along the overhead rafters of the room. The machine room is heated in a similar manner.

An interesting department is that where the winding of armatures and fields is carried on. Here armatures of all sizes are seen in the various stages of manufacture and it was noticed that every winder exercised the greatest care in doing his work properly, which is largely the secret of the success attained by the Crocker-Wheeler machines. A dynamo armature was being wound for a 10,000 volt current. This machine was designed for the use of Prof. Crocker at Columbia College, for experimental work. The wire used for the coils is very fine, and double silk insulated.

In the machine shop and assembling department a large number of hands were at work on the various machines, but the absence of shafting, usually found in abundance in similar shops elsewhere, was very noticeable. Huge drills, die presses, punches, etc., received their power from motors connected either directly or through gearing.

The design of these machines is such that the motor frame and parts are made practically a part of the machine to which they supply the power. In the power lathe, for instance, the electric motor is placed in the head stock and is so compact in design that it is hardly noticeable to the casual observer.

A radial drill of extraordinary dimensions is operated by a 1 H. P. motor placed on the top of the central column, the power being transmitted to the drill by bevel gearing. Ferracute and Bliss punches are used in this department for punching out armature core discs.

An electric crane in this room attracted much attention. A 5 H. P. motor is used for hoisting, and a 2 H. P. machine for moving the machine. The motors are controlled from the floor by the operator.

The machine and assembly room is 400 feet long and 80 feet wide at its widest part, and receives a great abundance of light through a large number of windows.

In the engine room are located an 80 H. P. Buckeye engine and several generators ; two of these generators supply the power current for the machine department and two are used for the testing current, 30 H. P. being required for the shop, and from 15 to 60 H. P. for the testing department.

The company intends to put a new Corliss engine in soon, of about 200 H. P.

In a building by itself is the draughting department, where nine draughtsmen are employed, and the office and engineering department occupy another separate building. In the office telegraph and telephone wires are worked directly with New York, and in this way the company's headquarters are in constant communication with the factory, eleven miles away.

About three tons of copper bars are used in the factory for the distribution of current.

The company is also extensively engaged in the manufacture of its well-known multipolar generator, and many of these machines were seen in all stages of construction. They are used altogether throughout the plant for the generation of currents. The Crocker-Wheeler generator is very symmetrical in form and said to be highly efficient in operation.

The party returned to New York about five o'clock, and every one was evidently well pleased with the visit.

While the visitors were waiting for the arrival of the return train Mr. H. Ward Leonard proposed that a vote of thanks be extended to Messrs. Crocker and Wheeler for their hospitality, and a resolution to this effect was heartily passed.

Among those present were Prof. F. B. Crocker, Dr. S. S. Wheeler, Frank J. Sprague, H. Mc. L. Harding, H. Ward Leonard, H. L. Lufkin, W. J. Hammer, Prof. W. A. Anthony, C. O. Mailloux, Geo. A. Hamilton, Ralph W. Pope, T. C. Martin, W. J. Johnston, Thos. R. Taltavall, M. C. Sullivan, Geo. R. Metcalfe, A. A. Knudson, Dr. Chas. E. Emery, and many others.

QUESTIONS AND ANSWERS.

Correspondence from practical men upon topics of interest relating to electricity and kindred subjects, will find a place in this department.

The publishers, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Our readers are invited to avail themselves of this department when desirous of seeking or imparting information on questions of general interest.

DEATH OF MR. DE SAUTY.

Mr. Charles Victor de Sauty, well-known through his connection with the laying of the first Atlantic cable in 1865, died at Gibraltar on April 11 last, at the age of 63 years. At the time of his death Mr. de Sauty was acting as superintendent of the Eastern Telegraph Company's station at that place. Besides participation in the laying of the cable above referred to, Mr. de Sauty took part in many other cable expeditions. His method of cable testing was used for many years by telegraph engineers, particularly that relating to electro-static capacity.

PLANKED SHAD FOR MR. AYER.

Arrangements are being made by John A. Seely, of the Complete Electric Construction Co., of this city, Cyrus O. Baker, Jr., of Newark, N. J., and Charles A. Bragg, of Philadelphia, to entertain Mr. James I. Ayer, of St. Louis, ex-president of the National Electric Light Association, when that gentleman visits New York again. The generous hospitality of Mr. Ayer, during the recent convention in St. Louis, has not been forgotten and when he comes East again, which he expects to do about the first of June, a number of his friends, headed by the gentlemen above named, will convey the person of the aforesaid Ayer to a hamlet in New Jersey, by the name of Gloucester, where the entire party will indulge in a planked shad dinner. It will be a very enjoyable affair.

NEW PROCESS OF ELECTRO-PLATING.

Dr. Otto, the well-known electrician of New York city is now connected with the Cramps, the shipbuilders on the Delaware. He is engaged in electro plating the interior of the cruisers and iron steamships built by that firm. The plating is accomplished by the use of a metalic brush in applying the liquid solution, the brush being connected with a dynamo by a flexible cord. Dr. Otto states that the soluble salts of any metal can be deposited in this way.

Some of the cruisers have been plated with nickel by this process, which Dr. Otto is patenting.

KERITE FIREWORKS.

The Day's Kerite people have been so long dealing with good things that they are very quick to see other good things. They are always striving, of course, to impress upon the minds of electrical people that Day's Kerite wires and cables are the best made, and they have hit on a very unique plan of producing such an impression; they actually burn it in. Messrs. Cushing & Morse, of Chicago, the western agents for Kerite, have hit on a happy idea of advertising their wires and cables. On a small sheet of tissue paper are represented two station managers, each lighting a cigar. On the paper is also printed a dialogue between the two men, to the effect that it always pays to use the best wire. One of the managers who has had bad luck with his circuits, asks what reliable wire there is. The other says, "give me a light and I will tell you." Printed directions are then given to apply the lighted end of a cigar or cigarette to the cigars in the picture, and watch the result. The result is that the word "Kerite" is burned out of the paper, the flame following out the letters exactly.

CONTRACT AWARDED FOR NIAGARA FALLS POWER.

Advices from Niagara Falls are to the effect that the Niagara Falls Power Company has made a contract with the Cataract Electric Companies of Rochester and Jamestown to furnish power. The right to furnish electrical power all over the State, has been granted the Power Company in the amendment to its charter passed by the last Legislature and approved by Gov. Flower on April 25. Section 2 of this amendment gives the Power Company the right "to conduct, convey, and furnish the water of the Niagara River, but not in excess of the amount heretofore expressly authorized by law, or any power, heat, or light developed therefrom, to, in, and through any civil division of this State, and to sell, furnish and deliver the same to any and all bodies or persons, public or private, wherever situated." This gives the Niagara Falls Power Company the entire State as its field to operate in. In the original charter its field of operation was confined to Erie and Niagara counties.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, May 20, 1893.

We are in receipt of a copy of a neat little pamphlet gotten up by the Commercial Cable Company, for distribution at the World's Fair. It contains a brief history of the Atlantic Cable and the Commercial Cable Company, and among the illustrations given is one of the Great Eastern as she appeared while grappling for the lost cable in mid ocean, on August 12, 1865. Views of the cable signaling apparatus and the Commercial Cable Company's office in various cities throughout the world are given. The facts contained in the pamphlet are worth preserving, as they have been carefully collected.

Mr. Merrill the New York agent for the Underwood Cotton Leather Belting Company, 38 Cortlandt street, city, is having excellent success. He is shipping these belts to electric light and power companies almost daily. These belts have stood the tests of years and command the highest testimonials.

The "Ward" arc lamp is the standard for incandescent circuits, over 20,000 of them being in use all over North America. Many thousands are used in cities of Mexico, South America, Australia and Europe. The lamps are made for any voltage. The ornamental lamp is finished up in an extremely artistic manner, and is adapted for elegant surroundings.

The J. G. Fowler Company of Elizabeth, N. J., is getting its factory in condition to carry on the business of building street cars. The company hopes to move into the new factory in June. The office is in the Havemeyer building, city.

The Medbury insulation railway specialities for overhead work for electric railroads are made by the New York Electrical Works, 161 Washington street, city. The goods are meeting with a ready sale among buyers of first-class articles. The strain insulators and trolley hangers, stand the severest tests without the least ill effect. They are said to be sold at the closest margin of profit commensurate with first-class work.

The De Mott "Turret" motors are quite the rage at present. Call and see them at the De Mott Motor Company's Works, 171 Greenwich street, corner Cortlandt.

J. H. Bunnell & Co., 76 Cortlandt street, city, the well-known manufacturers of electrical supplies, have added to their stock new electric railway specialties in overhead line appliances.

J. L. Ludwig has located in the Havemeyer building, city. He is carrying a full line of electric overhead line railway materials, and has secured the agency of the Green engines made by the Altoona, Mfg. Co. of Altoona, Pa. Mr. Ludwig has had years of experience with one of the largest manufacturers of electric railway motors and appliances in North America, and is thoroughly capable to equip a road in a perfect manner.

The Genett Air Brake Company has removed its offices to 33 Wall street, city.

The Dale Manufacturing Company, 90 Fulton street, will move next week to 22 Cortlandt street. A new line of goods will be added to its present large stock. The company will increase its facilities for the manufacture of electrical goods for supply houses, electricians and inventors, in quantities under contract. This will enable it to fill much larger orders. It is putting in a Crocker-Wheeler motor from which the necessary power will be derived.

C. E. Chapin, 136 Liberty street, is a buyer for local and out of town companies, firms and individuals. He is having unusual success in his business. He has a large line of samples of electrical appliances on exhibition. For a small commission Mr. Chapin will buy for any reputable house, goods in large or small quantities. He has added to his samples lately many electric railway appliances, also the Chamberlain raw hide pinion.

Peckham's standard "Elliptic" spring cantilever extension trucks are used extensively on many of the electric roads of the country. Hundreds of cars are fitted with these trucks on the electric roads of Jersey City, Hoboken, Brooklyn and New York. Mr. Edgar Peckham, the president of the Peckham Motor Truck and Wheel Company, makers of these trucks, has moved his office to 1,006 Havemeyer building, Church, Cortlandt and Dey streets. Mr. Peckham has spent many years experimenting with his trucks and he has brought them to a standard of perfection. They are constructed of the best iron for frame work and put together with hot rivets. All parts are machine fitted. The trucks are strong, easy-riding and have a long spring base. Mr. Peckham guarantees to prevent the oscillation of 30-feet electric cars.

McLeod, Ward & Co., 95 Liberty street, are installing a Billberg dynamo in Fisher's shoe house, on Duane street, with a White & Middleton gas engine. McLeod, Ward & Co. make a specialty of electrical installations for light and power and the ventilation of buildings, offices, etc.

Mr. F. C. Timson is taking orders for all goods manufactured by the Electrical Engineering and Supply Company, of Syracuse, N. Y. He has samples of all sizes of that company's incandescent switches, porcelain cut-outs and other parts that go to make up a complete incandescent plant.

Buyers of the Wing exhaust and ventilating fans, blowers, etc., all testify to their excellent qualities. These goods are made and sold by L. J. Wing & Co., 26 Liberty street, city. The fans and blowers are also combined with steam engines, electric motors or gas engines to suit the purchaser. They manufacture all their own goods.

C. D. Shain, 136 Liberty street, city, reports a big demand for Cutter electrical specialties. Mr. Shain secured the general agency for these goods a short time ago. The C-S. flush switches are taking extremely well with all architects, and hundreds are being placed in various buildings in this vicinity. The new system of lighting lamps from one floor and turning them off from other floors is meeting with high approval among all who understand Mr. Cutter's multiple system of electric lighting.

H. Ward Leonard & Co., 136 Liberty street, city, are installing incandescent electric light plants in the power house of the Broadway Cable Co., at Houston street and Broadway, and 56th street and 7th avenue. Each dynamo is of 80 kilo-watts capacity, directly coupled to Armington & Sims vertical engines. The dynamos are used in lighting the power-houses and tunnels. C. D. Shain, furnished the dynamos. He is also placing three dynamos in the new Betz building, Broad street and Market street, Philadelphia, for 4000 lamp plant.

The Wright Universal Electric Company has moved to 126 Liberty street, where it occupies a suite of fine offices on the main floor. It is preparing to exhibit a large statue of liberty, holding an incandescent lamp, the current for which is supplied by the Wright Company's batteries placed in the base, with the intention of enlightening the throngs of people passing the salesrooms, on the usefulness, strength and life of this make of battery.

Mr. James H. Mason, of Mason Battery fame, delivered a lecture on electricity at one of the Brooklyn churches a few nights ago, before a large audience. Mr. Mason's lecture was extremely interesting and well composed.

Chas. M. Rumrill and G. B. Rumrill are doing business under the name of Chas. M. Rumrill, electric railway supplies, 109 Liberty street, city. These gentlemen are widely known in the electric railway business. They took the agency a short time ago for New York New Jersey and Pennsylvania for the Medbury insulation electric railway appliances made by the Fibrite Company, of Mechanicsville, N. Y., for which the New York Electrical Works, city, are sole agents. Messrs. Rumrill carry a full line of these electric railway appliances. They have lately secured the contract for all the appliances for the New Paltz and Highland Ry., New Paltz, N. Y.

W. T. H.

BROOKLYN NOTES.

The J. G. Brill Co. of Philadelphia, fitted out the De Kalb avenue line of electric cars in Brooklyn. These cars are remarkable for their easy riding and fine workmanship, and no better equipped car can be found anywhere.

The new Riker motor propeller and rudder combination for small boats is meeting with deserved praise by everyone who has seen it. The Riker Electric Motor Company, 45 and 47 York street, Brooklyn, manufacturer of Riker dynamos and motors for all purposes is receiving numerous orders for the above named outfit. A person can easily fit his own boat with these motor propellers. The motor is secured to the top of the rudder and connected to the propeller by a chain belt, the propeller being fastened to the bottom of the rudder. The rudder can be shipped or unshipped with ease. With a few cells of primary or storage battery a small boat may be driven at a good speed. The combination is made for all sizes of boats.

Mr. Andrews, the machinery manufacturer, of 286 Graham street, Brooklyn, is making a special upright double spindle tapping machine of great merit. One main shaft runs two spindle shafts, each at a different speed. The spindles are adjusted by hand and are always in a central position. A good table for the work is provided. The General Electric Company uses eight or ten of these tapping machines at its Lynn factory, and a number are in use by other prominent manufacturers of electrical apparatus. The machine will take up to a 3-8 inch hole. The standard two-spindle machine is always in stock. The taps are forced down by a hand lever; raising this, reverses the direction of rotation of the tap. The machine is made with any number of spindles desired and all the spindles may be run at the same speed or each at different speeds, to suit the requirements of the work.

Hubel & Manger, 286–289 Graham street, Brooklyn, are manufacturers of household electrical goods such as bells, pushes, etc. They are constantly adding new lines of goods. A number of very handsome pushes and letter boxes were shown by them the past week. The firm is very busy filling orders for out of town supply houses and contractors. They have just brought out a new bell with many improved features.

The Citizens Electric Light Co., has, it is reported, signed a contract with the Electric Wiremen's Union granting the men all their demands.

The striking linemen of the New York and New Jersey Telephone Company are still out. Linemen brought from distant points refused to take the places of the strikers when they were told of the situation, and they returned whence they came. The men are sanguine of success.

NOTES FROM NEW JERSEY.

Williams & Co., Plymouth street, Jersey City, report a good business in their tempered copper commutator sections, fuse wire, cast gongs of special bell metal and other electrical goods.

The Dixon Crucible Company, of Jersey City, N. J., is doing a large business in its specialties. The belting compound sold by this company is meeting with great favor. It preserves and renders more flexible all kinds of belting. The compound is used with great success to remedy the slipping of belts. The company's graphite and plumbago is also meeting with great demand among the trade.

Mr. Randell, of Hoboken, the manufacturer of wood moldings for electric wires, is very busy. Several large New York contractors have lately placed all their orders for moldings with him.

Joel H. Woodman, of Hoboken, N. J., is the largest manufacturer of car seating, complete car seats and perforated wood for car ceilings. He is having unusual success and is hardly able to keep up with his orders. Mr. Woodman has purchased several lots in the rear of his works and intends to enlarge his factory, adding men and machines necessary to meet his growing trade.

CATALOGUES.

The Canton Electrical Co., Canton, Ohio, has just issued a neat catalogue of the Keller dynamos, motors and power generators manufactured by that company. These machines are noted for their simplicity of construction and efficiency. The motors range from $\frac{1}{8}$ to 30 H. P. and a large stock of $\frac{1}{12}$ H. P. motors is kept on hand.

The Manhattan Electrical Supply Co., 36 Cortlandt street, city, has just issued a pocket edition of its cata. logue. It contains 96 pages and is profusely illustrated- The pocket edition consists of no less than 50,000 copies.

We are in receipt of a copy of the neat catalogue issued by H. H. Harrison, railway supplies, 29 Broadway, New York city, representing the W. T. C. Macallen Company, manufacturer of solid sheet mica insulation, 416 Atlantic avenue, Boston, Mass. The catalogue illustrates the latest and most improved forms of overhead railway insulations as well as a complete line of insulating joints for gas and electrolier fixtures, brought out by the Macallen Company. Sheet mica does not deteriorate when subjected to climatic effects. It is fireproof and impervious to chemical action, thus it is very valuable as an insulator.

OPEN CONTRACTS FOR ELECTRICAL BUSINESS.

OFFICIALLY ANNOUNCED.

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All further available information can be obtained by our subscribers in applying by letter directed to Electrical Age, Dept. C, First Floor, World Building, New York. Reference must be made in each case of such application to the number in the following table and postage for answe must accompany the inquiry.

No.	Description of Work, or Contract.	Party to whom proposals must be directed.	Time up to which the proposals must be handed in, 1893.			Further information and specification obtainable through Electrical Age from	Amount, if any, to be deposited with bid in certified check.	Right to reject any bid received.	Special Remarks.
			Month	Day	Hour				
1*	To light the streets of a village (suburb).	Board of Trustees of the village, at their rooms in the Town Hall.	June	6	8 p.m.	The Village Engineer.	$2,000	Reserved.	
2*	Lighting the streets of the city with electric lights, for a term of five years, from July 1, 1894.	Common Council of the City.	Sept.	1	12 m.	Chairman of Committee.			
3*	50,000 El. Inc. all solid Lamps.	Company controling the patent.	July	1	12 m.	Secretary of Co.		Reserved.	Option on exclusive license part of consideration.

The Rose Polytechnic Institute, an advertisement of which appears in this issue, is one of our leading Engineering Colleges, and is especially fortunate in its thoroughly modern equipment and plan of instruction. It lays special emphasis on the practical side of technical education, which it is enabled to do throughout the whole course of four years by its ample shops and laboratories and exceptionally complete outfit, especially in electricity.

On May 15, the Edison Light and Power Co., of San Francisco, Cal., began paying to the New York stockholders, through the New York Guaranty and Indemnity Co., a monthly dividend at the rate of 8 per cent. per annum.

The Electrical Age's Illustrated Record of Patents.

Issued May 16, 1893.

497,310. Automatic Disconnector. William A. Cullen, Paterson, N. J., assignor to the Johnston Safe Automatic Electric Company, Richmond, Va. Filed Jan. 28, 1893.

497,331. Automatic Time Stamp. Warren B. Martindale, Rochester, Ind. Filed June 30, 1892.

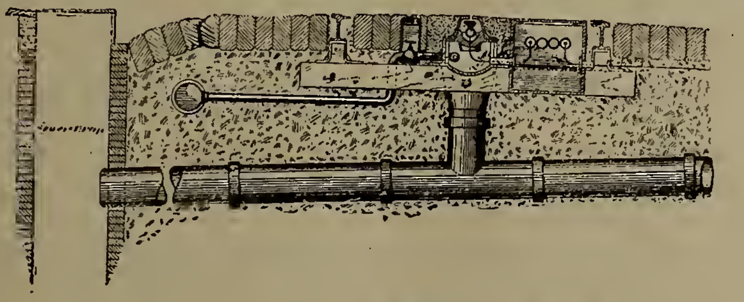
497,335. Manufacture of Telephone Cables. William R. Patterson, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Aug. 24, 1891.

497,336. Insulating Tape. William R. Patterson, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Aug. 24, 1891.

497,337. Overhead Electric Railway. William D. Patterson, Keokuk, Iowa. Filed Nov. 1, 1892.

497,356. Electric Car Truck. George S. Strong, New York, N. Y., assignor to James N. Gamble, Cincinnati, Ohio. Filed Jan. 25, 1892.

497,361. Commutator Brush-Holder for Dynamo-Electric Machines. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Nov. 2, 1891.



497,394—CONDUIT ELECTRIC RAILWAY.

497,366. Rheostat. Parvin Wright, Denver, Colo. Original application filed Jan. 16, 1892. Divided and this application filed Aug. 8, 1892.

497,377. Trolley for Conduit-Railways. Paul C. Just, Chicago, Ill. Filed April 20, 1892.

497,394. Conduit Electric Railway. George Westinghouse, Jr., Pittsburg, Pa. Filed April 8, 1892.

497,397. Lightning-Arrester. Alexander Wurts and Charles F. Scott, Pittsburg, Pa., assignors to the Westinghouse Electric and Manufacturing Company, same place. Filed Oct. 26, 1892.

497,404. Electric Cigar-Lighter. William P. Carstarphen, Jr., Denver, Colo., assignor of two-thirds to James E. Gregg, same place, and Richard W. Webb, Santa Fé, N. Mex. Filed Aug. 17, 1892.

497,408. Electric Railway Signal. William H. Jordan, Brooklyn, N. Y. Filed Sept. 10, 1892.

497,430. Circuit Protector. Harry W. Leland, Jersey City, N. J. Filed Aug. 6, 1892.

497,436. Sectional Contact-Conductor for Electric Railways. George Westinghouse, Jr., Pittsburg, Pa. Filed April 11, 1892.

497,438 Arc Electric Lamp. John C. Wray, Peoria, Ill. Filed March 21, 1892.

497,439. Wire-Hanger. Arthur J. Wylie, Rome, N. Y. Filed Oct. 14, 1892.

497,448. Galvanometer. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Company, same place. Filed May 9, 1892.

497,449. Galvanometer. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Company, same place. Filed May 9, 1892.

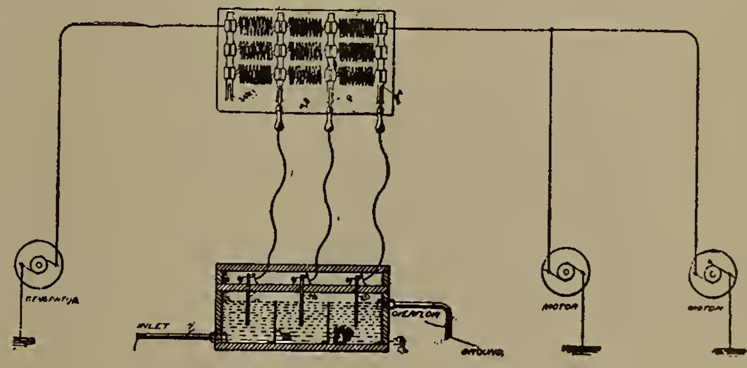
497,450. Electrical Lamp. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Sept. 22, 1892.

497,468. Dynamo-Electric Machine or Motor. Walter K. Freeman, Boston, Mass. Filed Nov. 3, 1892.

497,482. Shunt for Electric Light and Power Stations. Edward Weston, Newark, N. J. Filed Nov. 28, 1892.

497,489. Circuit-Controlling Device. John P. Buchanan, Boston, Mass., assignor to the Hall Signal Company of Maine. Filed Oct. 15, 1891. Renewed Oct. 22, 1892.

497,491. Automatic Cut-Out for Electric Light Circuits. Charles Cuno, Wauwatosa, Wis. Filed Apr. 16, 1892.



497,397.—LIGHTNING ARRESTER.

497,494. Electric-Arc Lamp. James Einstein, Munich, Germany, assignor to Paul Lemaire, New York, N.Y. Filed Nov. 23, 1892. Patented in Germany, July 22, 1890.

497,495. Electric Rink. Midbury W. Hassan, Rochester, N. Y. Filed May 28, 1891.

497,504. Armature-Core for Electric Motors. James E. Stuart and Ulysses S. James, Helena, Mon. Filed Oct. 24, 1892.

497,508. Lightning-Arrester. Alexander Wurts, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Dec. 22, 1892.

497,509. Lightning-Arrester. Alexander Wurts, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Dec. 22, 1892.

497,515. Insulator. Thomas H. Brady, New Britain, Conn. Filed Jan. 16, 1893.

497,521. Electric Measuring Instrument. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Company, Saco, Me. Filed Nov. 14, 1891.

497,522. Galvanometer. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Company, Saco, Me. Filed Nov. 14, 1891.

497,535. Process of Manufacturing Electric-Conduit Sections. James F. Cummings, Detroit, Mich. Filed July 12, 1892.

497,536. Underground Conduit for Electrical conductors. James F. Cummings, Detroit, Mich. Filed July 28, 1892.

497,539. Electrical Measuring-Instrument. Oscar Frolich, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Oct. 25, 1892. Patented in Germany, Aug. 18, 1888.

497,552. System of Conductors for Electric Fire Engines. Joseph Sachs, New York, N. Y. Filed May 26, 1892.

497,558. Electric-Arc Lamp. Frank H. Thompson, Philadelphia, Pa. Filed Jan. 19, 1892.

497,563. Electric Pump-Governor. Charles R. Whittier, New York, N. Y. Filed Aug. 8, 1892.

497,621. Process of Electric-Tin-Plating. Louis Aronson, New York, N. Y., assignor of one-half to James H. Hoffman, same place. Filed Jan. 31, 1893.

497,649. Magneto-Telephone. James P. Freeman, Washington, D. C., assignor to Marvin C. Stone, same place. Filed May 16, 1892.

497,732. Binding-Post Fuse. Simon H. Stupakoff, Pittsburg, assignor to the Union Switch and Signal Company, Swissvale, Pa. Filed Sept. 5, 1892.

497,755. System of Electrical Distribution. Waldemar Meissner, Konigsberg, Germany, assignor to Siemens & Halske, Berlin, Germany. Filed Oct. 23, 1889. Patented in Germany, May 23, 1889, and Nov. 18, 1889; in Austria-Hungary Sept. 19, 1889; in Switzerland Sept. 19, 1889; in Norway Sept. 19, 1889; in England Sept. 19, 1889; in France Sept. 19, 1889; in Belgium Sept. 19, 1889; in Sweden Sept. 19, 1889, and in Italy Sept. 19, 1889.

497,756. Circuit Switch. Ernest Woltman and Harry A. Triggs, Denver, Colo., assignors to the Electrical Specialty Company, same place. Filed Jan. 17, 1893.

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RETURN CURRENTS.

The West End Railroad of Boston has a very efficient method of returning the current of the power stations. A regular system of return feed wires has been instituted, connecting at every fourth pole throughout nearly the entire system, with the rails and supplementary wire, which is under the pavement. The current has thus only about 250 feet to travel on supplementary wire and in earth, when it is taken directly back to the station by means of the large return wires. It is stated that the company is ready to place all feed and return wires underground as soon as the legislature prescribes the method by which they shall be put in.

FUSE METALS.

In our present issue we conclude the very instructive article on the "Action of Continuous and Alternating Currents on Fuse Metals," by C. P. Matthews. There has been in the past a good deal of guess work applied to the selection of fuses for the various uses to which they are applied. A detailed investigation such as this is of great value to both the practical and theoretical man. The causes of the changes in the fusing point of the metal are of interest and should be carefully noted for future use. The effects of alternating currents on fuse metals are also of great importance. It is shown by experiments that there is a decided rise in the resistance of fuses, thus used, and to such an extent, that it takes away from their reliability. This is a matter that should be given careful attention, and it is to be hoped that Mr. Matthews and others will continue their investigations.

PRINTING SPEED COUNTER.

A very valuable piece of apparatus has been designed and placed in practical operation by Prof. Geo. S. Moler, of Cornell University, and is described and illustrated in our present issue. It is an automatic printing speed-counter for the use of experimenters. This ingenious device makes a record of the speed at the end of each minute upon a strip of paper. The present machine is designed for shaft speeds of from 30 to 185 revolutions per minute.

The usefulness of this counter is very apparent to those who have had to do with experimental work where the speed was an important factor. With the ordinary counter not only is time lost between readings caused by setting the instrument back to zero, but it is very difficult to get the exact speed, especially if that be high, as there are so many factors of error. In case of shafts driven by water power a machine of this kind seems to be of the utmost value as it would be almost impossible to obtain a correct average speed without it.

ILLUMINATING THE INTERIOR OF THE BODY.

A very interesting experiment was performed at the Academy of Medicine in this city one night last week, which suggests a wider application of the electric light for the diagnosing of diseases, and the exploration of various parts of the human body in surgical operations. An incandescent lamp was placed in a boy's mouth which was then closed. The lights in the hall were then turned down, and the current turned on the electric lamp. The light shone through the boys cheeks with startling effect, bringing out in clear detail every vein and line of the skin and gums.

NEW RAILWAY MOTOR.

The efforts of street railway electrical engineers have been, for sometime past, concentrated on the improvement of the street railway motor. It was universally recognized that all motors in use heretofore have been to some extent marred by shortcomings, which eliminated, would render the device more efficient and more perfectly adapted to the needs of improved street railway service. Not the least of these shortcomings was the weight of the motor itself, on account of the influence which this item alone has upon the amount of money expended upon keeping the tracks in good repair.

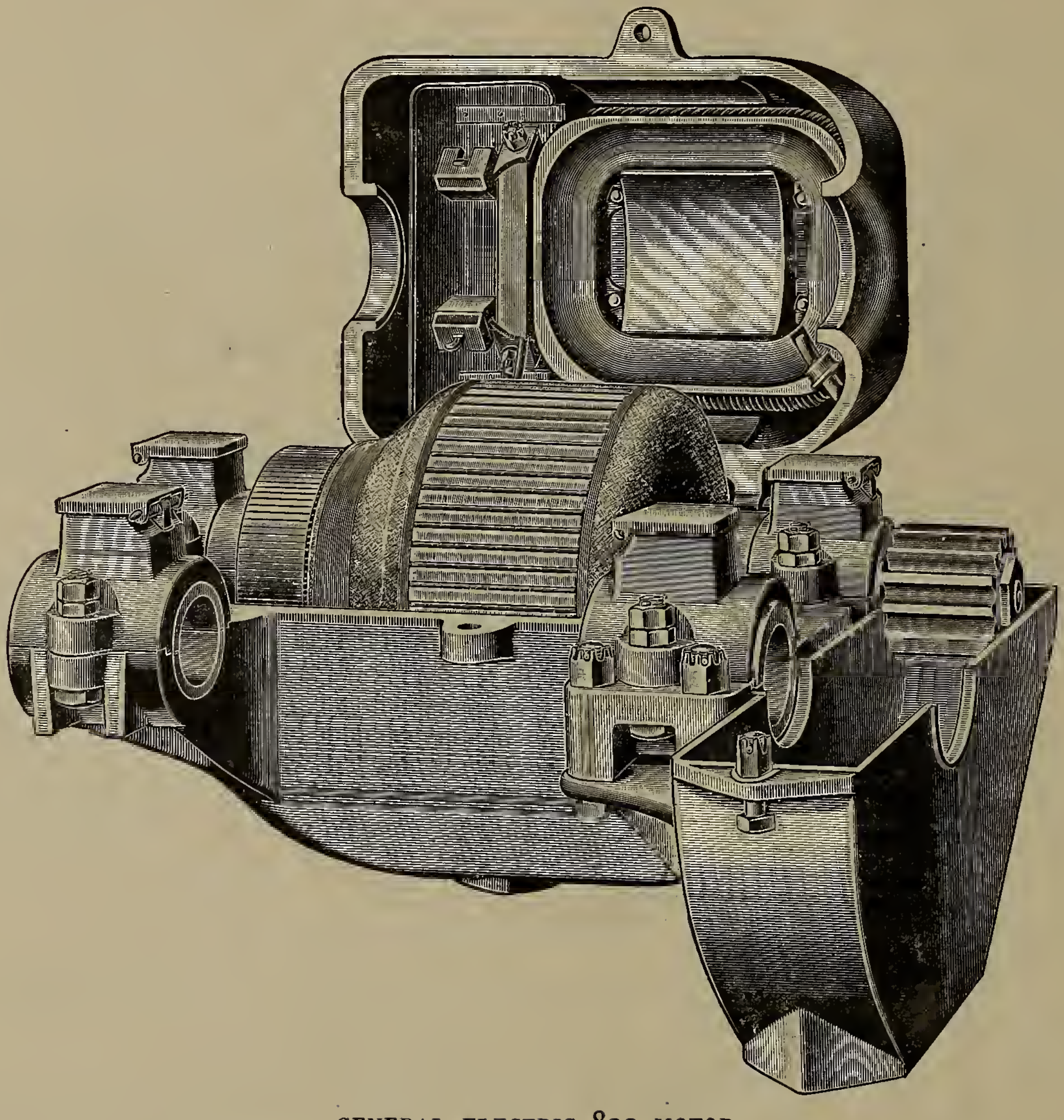
From the new motor, known as G. E. 800, which the General Electric Company, has just put out, the shortcomings which have characterized all other motors, and which have been rendered evident under actual working conditions have been to a great extent eliminated or greatly modified. To all appearances, it is the most perfect, as it is the latest motor at present before the street railway world.

The nomenclature of 800, has been given to this motor, as indicating its ability to exert a horizontal effort of 800 pounds through a 33″ wheel continuously in ordinary street railway service. This rating is more accurate than that customarily employed, and adopting the General Electric Company's usual conservative method of rating in horse power, the motor becomes a 25-H. P. motor.

It is a four-pole motor of new design. Its principal characteristic and one that will recommend it especially to street railway men, is that it is the lightest street railway motor, for a given out-put, of any other motor, now or heretofore, presented to the public. This matter of reduction of weight has been studied with considerable care, with a view of meeting the demands of the continually growing street railway business. The question of preservation of tracks is one of deep importance to every operating electrical street railway company. The extent to which it usually figures on the balance sheet has shown that errors must no longer be made, and has created a demand for a motor light enough to reduce the wear and tear of track to a minimum.

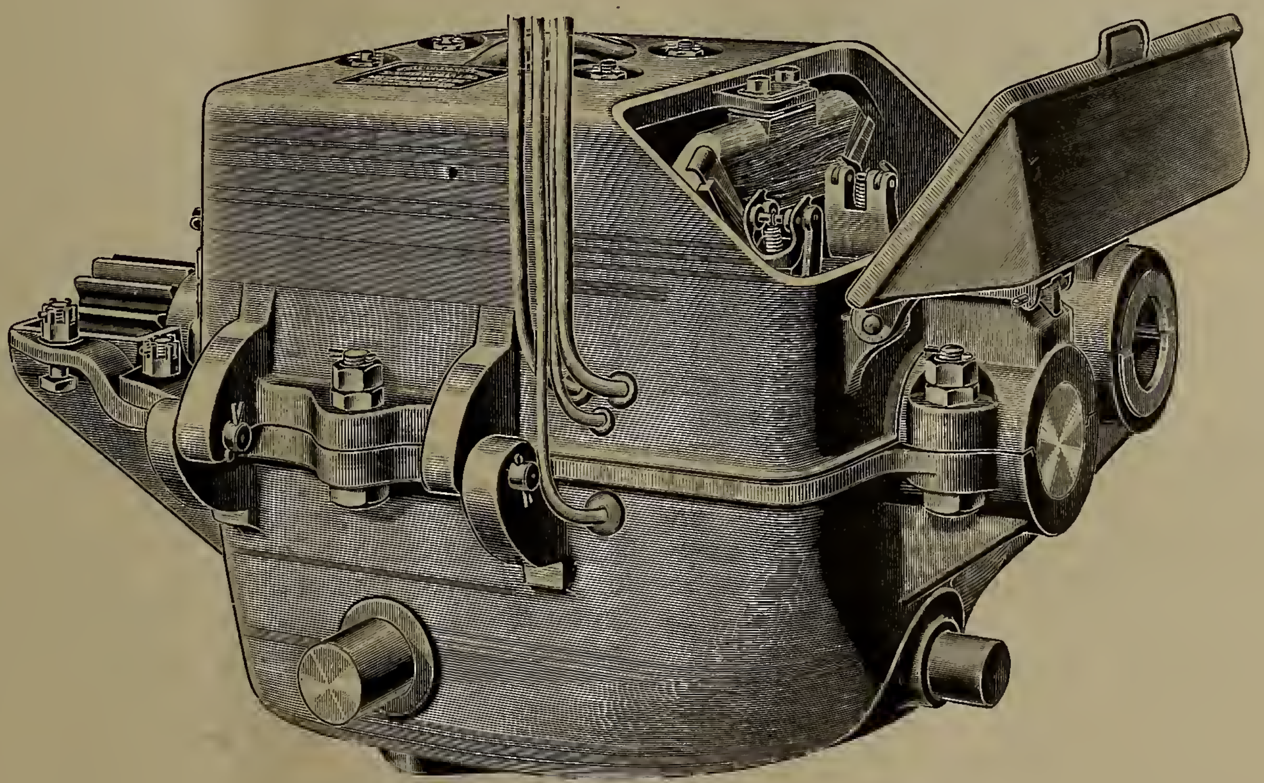
In suspending this motor on the cross frame of the truck, it will be so hung that only 500 lbs. of its weight will bear directly on the axle. From this it will readily be seen that the dead blow delivered from the axle to the truck, is enormously reduced, when comparison is made with the work of other motors.

Working parts are more easily accessible even than in the well known W. P. motors. The aperture necessary for the purpose of inspection, cleaning, etc., is so designed that when closed, those parts which could be damaged by water—the brush holders, commutator, armature and field spools, are so entirely enclosed in a watertight box, that the entire motor could be immersed in water, and still operate as under normal conditions. This advantage is one which can be easily appreciated by those engaged in the practical operation of electric railways, since it renders the motor of equal value in either summer or winter service, in either bad or good weather.



GENERAL ELECTRIC 800 MOTOR.

The motor, even closed up as it is, runs much cooler than previous motors that were entirely exposed. It can be taken apart with the utmost facility. The top frame is hinged on to the lower frame and, with its proper parts, weighs only 350 lbs. On the removal of only two bolts it can be thrown back completely out of the way of the armature, or by the removal of the hinge pins the top frame can be lifted into the car, or by moving the nose plate forward the motor can be swung upon the ring axle as a hinge so as to be accessible from the pit, the top field then being swung on its hinges still lower into the pit, in which position the armature and field spools can be easily removed; or by the removal of the top of the gear case and two axle caps the motor can be lowered as a whole into the pit. The armature is short and can be lifted through an ordinary trap door. It will thus be seen that the motor can be handled either inside the car or from without with almost equal facility. On opening the lid over the commutator easy access is had to the whole width of the commutator and brush holders, the latter being of the simplest possible construction and easily operated with one hand. There is also plenty of space to permit of the pit of the motor being reached. The bottom of the armature is two inches above the pit of the motor, so that it is not liable to be injured by articles falling inside of the motor frame. The construction is such that it is practically impossible for any grease to get inside of the motor.



GENERAL ELECTRIC 800 MOTOR.

The armature is similar to that used on the well known W. P. motors and is made both in the Gramme ring and in the drum form. The drum winding has been carefully studied and the many objections to the various kinds of drum windings that have from time to time been put upon the market have been carefully guarded against. A thorough trial has demonstrated that the drum winding of this motor can be relied upon. It will be free from the danger of burning out at the ends, heretofore common with this kind of winding. The Gramme armature and drum armature are interchangeable.

No point of fault which motors of all makes have manifested has passed unstudied, and in the motor under consideration the General Electric Company believes that it has been able to do away not only with the ordinary defects, but also those which only declare themselves under certain contrary and extraordinary conditions. The electrical qualities of the machine have been subject to several months of stringent test under actual service conditions, with most successful results.

NEW MEMBERS.

At the regular monthly meeting of Council of the American Institute of Electrical Engineers held on May 16 last, the following associate members were elected:

Fred. Fiske Barbour, Manager, Power and Mining Department, Pacific District, General Electric Company, 15 First street, San Francisco, Cal.

A. Barth-Bartoshevitch, Mechanical and Electrical Engineer, Westinghouse Electric and Mfg. Co., 160 Arch street, Allegheny City, Pa.

Waldo C. Bryant, Manager and Treasurer, The Bryant Electric Co., Bridgeport, Conn.

James Burke, Electrical Engineer, General Electric Co., 24 Front street, Schenectady, N. Y.

John Alfred Cabot, City Electrician, 123 Garfield Place, Cincinnati, Ohio.

Adolph Frederick Christmas, Manager, Electrical Department, Johnson Co., Johnstown, Pa.

J. Hally Craig, Cumner, Craig & Co., John Hancock Building, Boston, Mass.

Manuel Ignacio da Cunha, Manager of the Electrical Section, Emprera Industrial Gram-Para, Para, United States of Brazil.

Thomas B. Doolittle, Engineering Department, American Bell Telephone Co., 125 Milk street, Boston, Mass.

Henry W. Frye, Associate Editor, The *Electrical World*, Times Building, New York city.

Clarence E. Gifford, Assistant Electrical Engineer. The Buffalo Railway Co., 860 Prospect avenue, Buffalo, New York.

George Heli Guy, Secretary. The New York Electrical Society, 131 West 34th street, New York city.

Charles A. Lieb, General Eeletric Co., 44 Broad street, New York city.

James Grieve Lorrain, Norfolk House, Norfolk street, London, W. C., England.

Charles P. Matthews, Instructor in Physics, Cornell University, 15 Heustis street, Ithaca, New York.

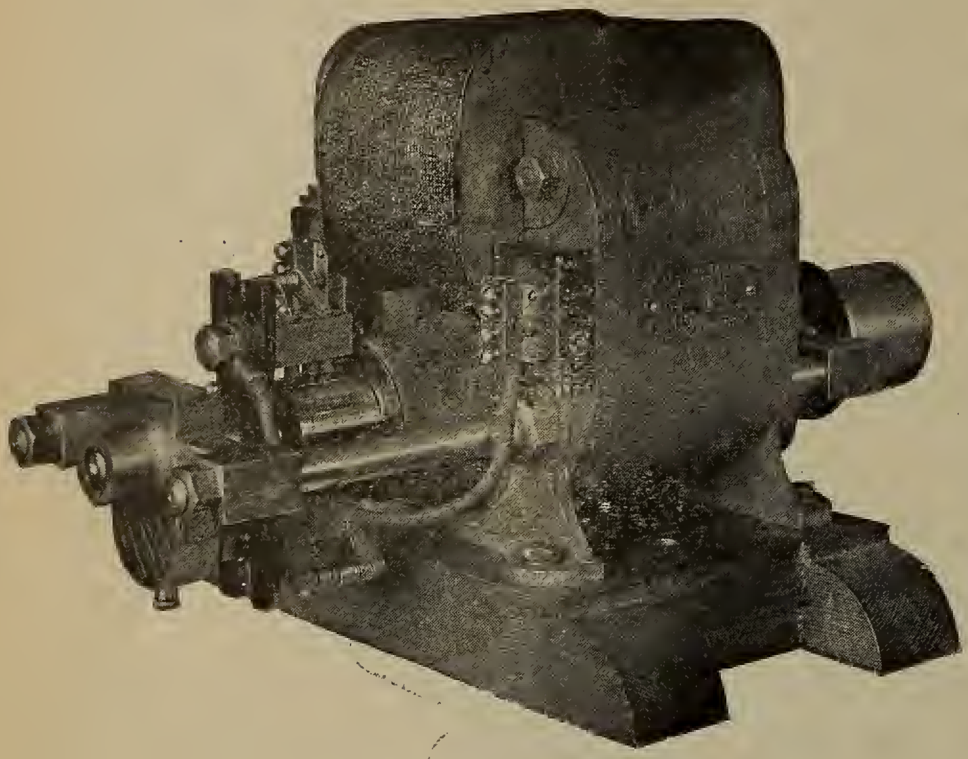
Theodor J. W. Olan, Civil and Electrical Engineer, New York city.

Walter M. Petty, W. M. Petty & Co., General Electri

(*Continued on page 346.*)

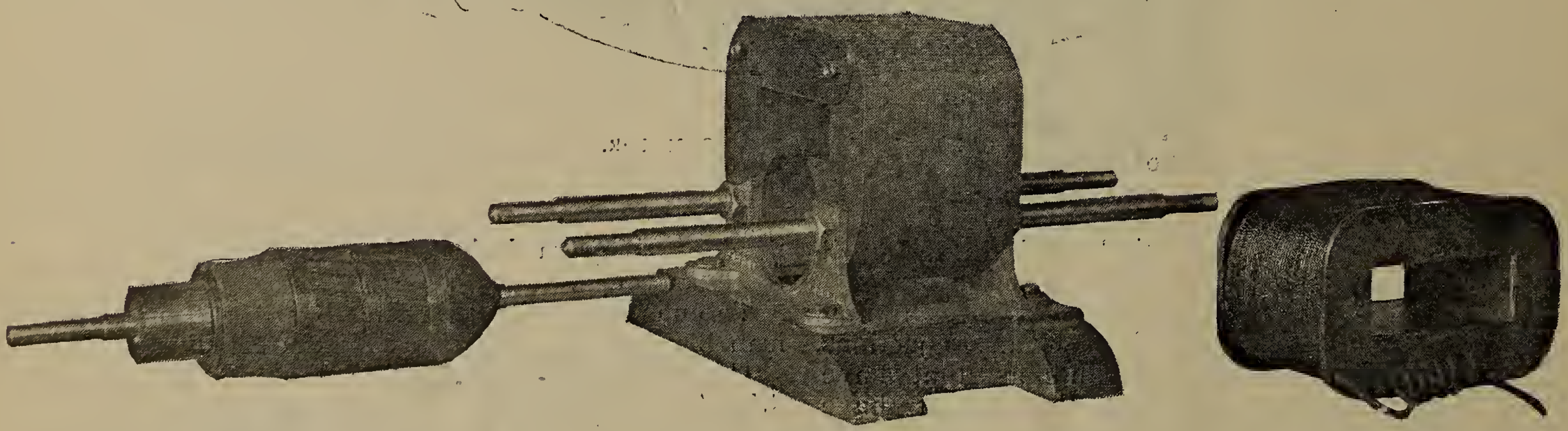
NEW PERRET MOTOR.

Our illustration represents a new type of Perret Motor brought out recently by the Elektron Mfg. Co., of Springfield, Mass. As in all the motors and dynamos made by this company, the lamination of the field magnet cores is adhered to in these machines. The armature is in all respects the same as that used in the well-known Perret machines of the consequent pole type which have gained a wide reputation for efficiency and mechanical excellence in the past four or five years.



NEW PERRET MOTOR.

The new machines, although much simpler in construction, by reason of having one field coil instead of four, are even more efficient than the consequent pole type. The iron is of the best for the purpose; the magnetic circuit is short, and, by means of a patented method of dove-tailing the iron plates, the single joint in the core is most perfectly made.



ARMATURE. MOTOR FRAME. A FIELD COIL.

The bearings are of composition bronze, and self-oiling, and for ordinary voltages carbon brushes are used.

This style of machine is made in five sizes, from one-fourth to two horse-power, inclusive, and are known as types X and Y. Each motor is accompanied by a neat fire-proof starting box.

Dinner.—Mr. M. R. Hults, manager of the Western Union telegraph office, Bridgeport, Conn., gave a dinner in that city a few nights ago to about thirty-five of his New York friends.

THE ACTION OF CONTINUOUS AND ALTERNATING CURRENTS ON FUSE METALS.[*]

By C. P. Matthews.

(*Continued from page* 326.)

Part II.

What has been said in Part I. will doubtless apply equally well to fuses on either direct or alternating current circuits, but in the latter case a new and annoying phenomenon, well worthy a special investigation, confronts the electrician. Reference is had to the subtle effect of the alternating current on fuse metals by reason of which they often yield when carrying currents well within their rated capacities.

In their attempts to study this peculiar effect of the alternating current, the chief difficulty encountered by the experimenters was the fact that their reports had to be submitted in a comparatively short time. The subject is peculiarly one requiring long periods in which the action, whatever its nature, may proceed far enough to yield results of definite and quantitative value.

After the fuses were mounted their resistances were found, and they were placed on the circuits available in the laboratory as follows :

Nos. 1 to 6 inclusive.	Alternating ∼ = 250	
Nos. 7 to 9 inclusive.	Alternating ∼ = 132	
Nos. 10 to 14 inclusive.	Direct.	———

These fuses were subjected to the action of the current for periods ranging from 83 to 487 hours—this variation being due to the fact that the circuits were used intermittently for lighting and for general laboratory purposes. From time to time additional resistance measurements were made. In the original report the change in resistance is exhibited graphically by means of curves. These curves are so widely different in form that their interpretation becomes a difficult matter, and the determination of any law impossible. They indicate, however, that a distinct rise in reistence occurred in all of the fuses on alternating circuits except No. 6, which shows a somewhat anomalous behavior. The maximum rise occurred in the case of No. 8, amounting to 29.6 per cent. in 105 hours. Of the fuses on direct current circuits, all but one showed a slight decrease in resistance, the maximum change being only 3.5 per cent. The figures for each specimen appear in a succeeding table.

That some molecular change actually took place was shown in the following way :—It being practically impossible to test wires of so soft material for tensile strength, it was considered best to subject them to an alternate torsional stress of a given amount, continuing the alternations and noting the number until the specimen gave way. A simple piece of apparatus was constructed for this purpose, and it did its work very well. Twenty pieces of each of the fourteen specimens were tested in this way. Ten of these had been subjected to current action, and ten had not. The change in brittleness in the case of the fuses which had been on alternating circuits was quite marked, being in no case less than 7 per cent. while the change in those which had been on direct circuits was, with one exception, negligible. These results, together with some data on the fusing points before and after the passage of the currents are given in the subjoined table :

No.	Rated Capacity	Fusing Current			Torsion Test			Hours Run	Per Cent. Change Resistance
		Before	After	Per Ct. Ch'nge	Before	After	Per Ct.		
1	2	8.83	8.56	3.06	14.4	10.9	24.	487	0.2
2	2	7.96	7.86	1.26	21.6	19.9	7.9	169	0.5
3	3	12.6	12.15	3.56	14.9	13.2	11.14	487	15.
4	3	8.46	8.24	2.6	28.8	22.4	21.4	169	0.4
5	5	17.96	17.46	2.55	21.7	18.5	14.8	170	2.2
6	10	27.4	25.3	8.3	13.3	11.7	12.	487	2.0
7	18	52.	46.4	10.8	14.8	11.	26.4	209	11.3
8	36	52.	45.4	11.9	15.2	13.6	10.5	105	29.6
9	18	52.	49.5	4.8	16.9	13.9	17.8	83	3.5
10	10	26.8	26.8	.3	24.1	23.9	.8	170	— 2.9
11	18	52.	51.5	.9	13.8	13.7	.7	203	— 3.5
12	18	52.	51.4	1.1	13.8	12.3	10.	296	— 0.1
13	25	65.06	65.02	.061	11.1	11.0	.9	300	— 2.3
14	25	65.06	65.	.092	11.4	11.3	.8	264	— 1.5

While these results may be considered as only a beginning along a line of work which is of both theoretical interest and practical value, yet they would seem to warrant the following conclusions :

(1) There is a distinct, although irregular rise in the resistance of a fuse on an alternating circuit. (2) This is perhaps to be accounted for by a change in the molecular structure of the metal. (3) This results in a decided lowering of the fusing current, in some cases at least, easily sufficient to affect the reliability of the fuse.

AN AUTOMATIC PRINTING SPEED-COUNTER FOR DYNAMO SHAFTING.*

BY GEO S. MOLER.

The automatic printing speed-counter was designed and constructed by the writer to supply a need felt of having a continuous record of the speed of the shafting which drives the dynamos and other apparatus being used by students in their laboratory experiments.

During part of the year the shafting of the dynamo laboratory at Cornell University is driven by waterpower, the wheels being situated at the bottom of a deep gorge, and several hundred feet distant. The power is transmitted by means of a wire cable running over large grooved sheaves, and the gate hoisting apparatus is operated by a wire rope passing around drums. No automatic regulator has yet been successfully applied to these wheels, so we have to rely upon hand regulation. On account of this, considerable variations of speed take place, although a tachometer is watched quite closely by the attendant in charge. The variations make it necessary in performing an experiment to continually take account of speed.

The printer (see Fig. 1) is essentially a speed-counter which prints the speed at the end of each minute upon a strip of paper, and does this continuously, requiring very little attention. It was built to give the speed of a shaft which runs at about 140 revolutions per minute, but it has a range of from 30 to 185 per minute.

It is connected to the main shaft of the dynamo laboratory by sprocket-wheels and chains, so that the shaft carrying the worm revolves at exactly the same rate as the main shaft. The type-wheel is about eight and one half inches in diameter, and is made by clamping printers' type between a disk and a ring fastened with screws to one side of it. The disk has a series of small holes drilled in it at equal distances apart, and dowel pins passing through holes drilled in the type, hold the latter in place. If any of the type becomes worn, or accidently bruised, the ring can be easily removed and new ones can be inserted. The type are spaced so as to correspond with the number of teeth of the large gear-wheel which engages with the worm. The printing is done upon a one-half inch tape of district telegraph paper. A typewriter inking ribbon is employed, and as it is fed along, it shifts sidewise back and forth so that the whole width of the ribbon is used. It takes several weeks to go once the length of the ribbon.

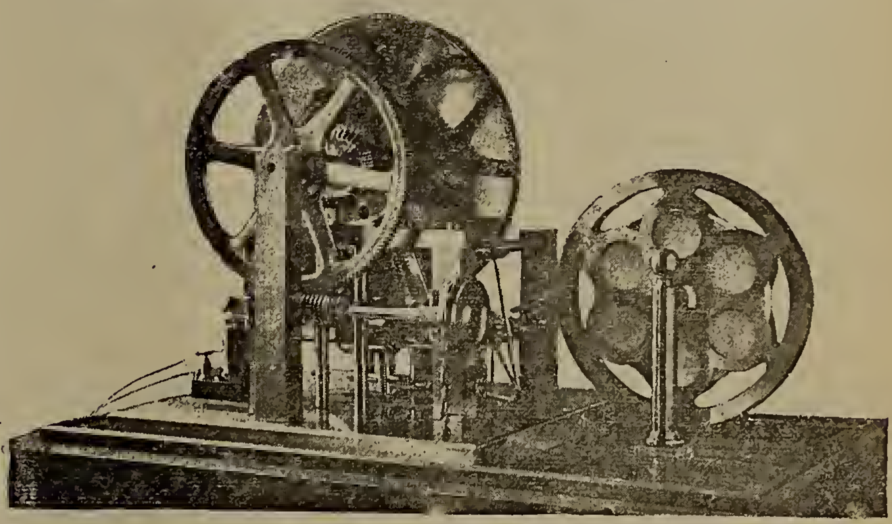


FIG. I.

The type-wheel practically starts from its zero reading at the beginning of each minute. It is necessary to have it to do this, in order that the number printed at the end of the minute shall be the exact number of revolutions for that minute.

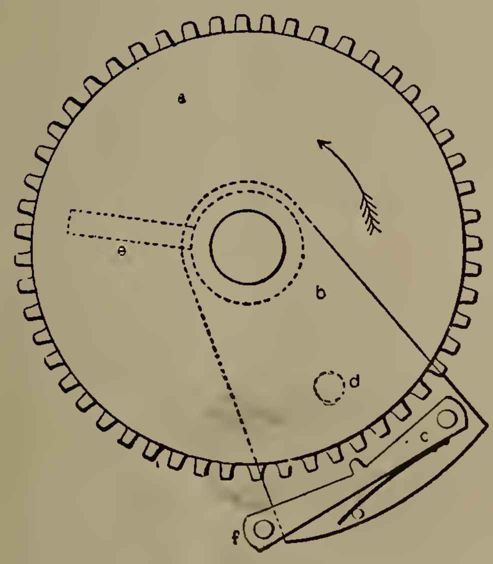


FIG. 2.

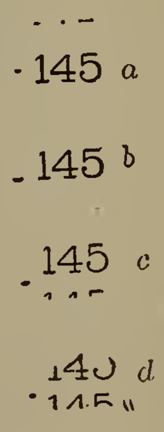


FIG. 3.

When a common speed-counter is used, its index is first set to zero, and it is then applied to the end of the shaft for just one minute, then is withdrawn and read. It is again set to zero, and the operation is repeated, but in doing this, a minute or more is lost each time while setting. Now if the speed were not too great, the index-wheel might be arranged so that it could be slipped backward or forward the proper amount, after reading, without stopping the counter. In this way a reading made from zero could be taken each minute. A similar method has been adopted in the printer. The type-wheel, which is held by friction on the shaft, and is carried with it is at the beginning of the minute slipped backward or forward until it has the correct relative position, then for the remainder of the minute revolves at the same rate as the large gear-wheel on the same shaft. The method of slipping the type-wheel around is partly shown in Fig. 2. The toothed wheel *a*, driven by the bevel gear, revolves once for every thirty revolutions of the main shaft. The plate or arm *b* revolves with it when the pawl *c* is allowed to catch in the teeth of the wheel. As the plate *b* goes around with the wheel, the pin *d* overtakes the arm *e*, which is attached to the type-wheel and pushes it along slipping the type-wheel on the shaft. When *b* has made one complete revolution, the pin *f* on the pawl *c* comes opposite a notch, not shown in the figure, into which it is pushed by a spring, thus pulling the pawl from the wheel, and also holding *b* stationary. It takes thirty revolutious of the worm to carry the plate *b* around, it coming to rest just at the end of the thirtieth revolution. If at this instant the printing hammer were allowed to act, the number 30 would be printed, but if it does not strike till the end of the minute the type-wheel will move with the large gear-wheel till that time. The striking of the hammer releases the pin *f*, and the pawl which has a spring of its own is again brought in contact with the teeth and so carries the plate *b* around again. If the type-wheel should complete its revolution before the pin *d* overtakes the arm *e*, then the arm *e* comes against another pin which stops it, until the pin *d* does overtake it. This is the slipping backward which has been mentioned. If the printer should be driven too fast, so that the type-wheel makes a revolution before the minute is up, or if the hammer is not caused to act for several minutes, then it will, the next time it acts, print a zero, which is the type under the hammer while the wheel is held stationary.

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*A paper read at the Tenth General Meeting of the American Institute of Electrical Engineers, New York, May 17, 1893.

The hammer is released at the end of each minute by means of an electro-magnet operated by a clock, and when the hammer makes its stroke, it opens a switch in the electric circuit while the contact in the clock is still closed, so in this manner the spark on breaking the circuit is made at the switch, and not at the clock contact. The hammer is set again by a pin on the side of a wheel coming in contact with a lever, and this closes the switch again before the next contact of the clock. When the machinery is not running, the switch remains open, and so the battery materials are not consumed in useless work.

The numbers move past a stationary point which prints its position upon the paper when the hammer makes its blow. If the number printed is exactly opposite the point, then there has been a whole number of revolutions that minute, but, if the number is above or below it, the fraction indicated by its position can easily be determined. Fig. 3 shows how the fraction of a revolution appears on the record. An exact number, 145 is shown at (*a*,) 145.25 at (*b*,) 145.5 at (*c*) and 145.75 at (*d*.) Usually enough of either the preceding or following number is printed to easily make it out, and to estimate the fraction, which can be read to one-fifth of a revolution. In the original design of this instrument, the question of adding a time printing device was considered, for it was thought to be necessary to know just the hour and minute that any part of the record was made. Such an attachment was planned but was not built, for the reason that in nearly all cases the record made will be referred to within the first few minutes after it is printed. If it is desirable to mark a certain point on the record to identify it, the paper can be displaced, and so leave a blank at that point. The paper is fed through at the rate of fifteen and one-fourth inches per hour, and so when necessary this distance can be taken as a unit of length to measure back, and mark off the hours.

One of the ways in which the record obtained is being used, is to find the ratio of its reading to that of the speed of the dynamo being experimented upon, then from the record to calculate the speeds for the different parts of the experiment, but this will only answer when the belt is able to drive the machine without slipping.

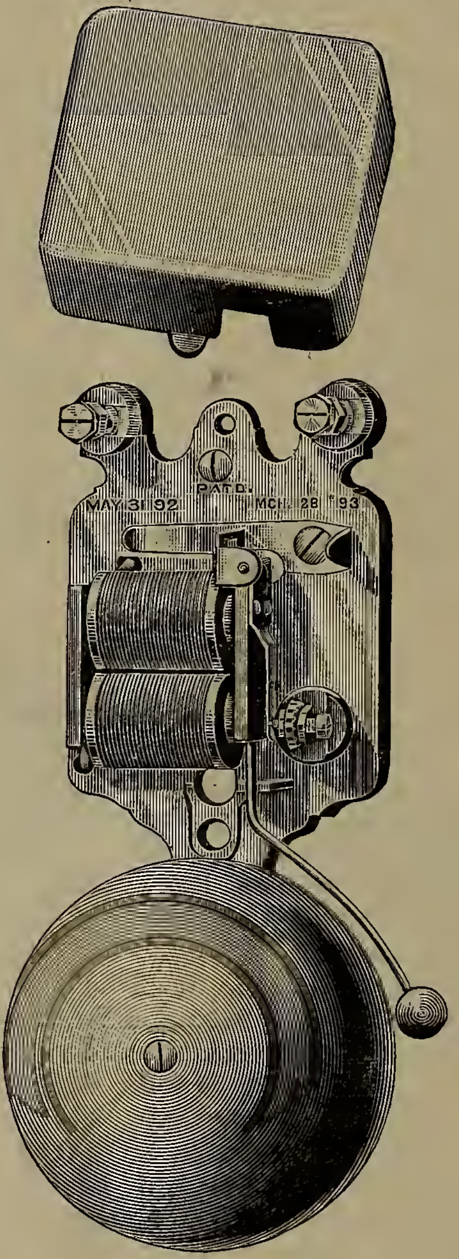
There is now being built a spindle which is to be tight geared to the main shaft, and which will run ten times faster, or about 1,400 revolutions per minute. This will be for the purpose of testing a student's ability to obtain a correct reading of speed, for the true speed of the spindle will always be ten times the printed speed for that same minute.

The printer which has been described has been running for about three months and has not failed in any respect to do the work that was expected of it.

IMPROVED ELECTRIC BELLS.

The use of electrical devices in the household is coming to be more and more prevalent. Electric bells have been used in this connection for many years, but still improvements are being made from time to time in the details of manufacture and of regulation.

An improved bell made either of wood or iron has recently been placed on the market which has several points of merit. A pivot is placed on one of the faces of the cores of the magnet spools, which are riveted to a raised iron piece, forming the back frame of the bell. An adjusting lever of brass is so constructed that the bell may be adjusted in whatever position it is placed. The armature is fastened on the pivot by an eye on the



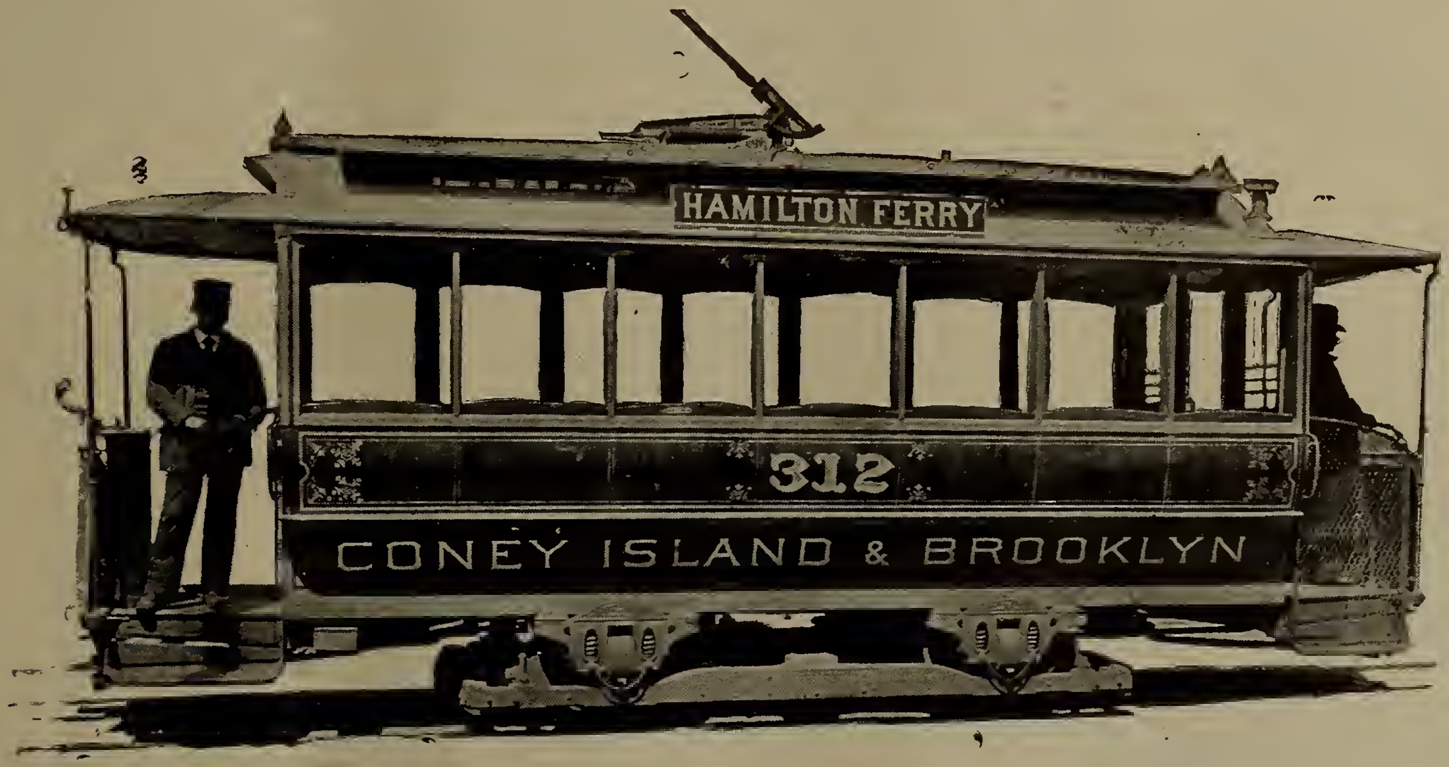
IMPROVED ELECTRIC BELL.

contact spring, which is riveted to the armature and passes to the contact screw, thus holding the armature in place. The contact screw is provideid with a lock nut. A second spring is riveted to the end of the armature and is bent at right angles so as to lie parallel to the side of the coils. It is placed directly behind the side of the rear coil and its end is confined by an adjustable lever. By changing the position of this lever a greater or less tension is given the spring and more or less power required to draw the armature to the faces of the magnets. When once adjusted no further attention is needed. The frame is so constructed as to allow connecting wires to be run under the base and two neat, substantial binding posts are provided for the exterior wires. The cover is held in place by a screw in the rear of frame.

This desirable bell is placed on the market by Messrs. Huber & Manger 286–290 Graham street, Brooklyn, N. Y., who are also the manufacturers of household electrical specialties.

STEPHENSON CARS.

The many improvements in the construction of street cars developed in late years have excited the wonder of even the most uninitiated, and the modern street car stands in the same relation as does the parlor car on steam railroads.



STEPHENSON ELECTRIC CAR ON CONEY ISLAND AND BROOKLYN RAILROAD.

When one stops to think of the luxury attending street car rides now-a-days, compared with what the facilities in "ye olden times" used to be, and all for 5 cents, there is indeed good reason for the wonder and admiration of the public.

It is the old story, however; one improvement follows another, and when electricity was introduced on street car lines, an artistic taste was likewise fostered which has been developing ever since with wonderful results.

One of the most modern specimens of street car construction is that shown in the accompanying illustration It is one of ten similar ones made for and in operation on the Coney Island and Brooklyn Railroad by the old and well-known car building establishment, the John Stephenson Company, of 47 East 27th street, New York city. They are very finely finished and easy riding.

The distinctive feature of these cars is that they are "Stephenson" cars from top to bottom. The car body is finished in an excellent manner, the inside trimming being of ash, and the metal fittings of bronze. The body is 18 feet long, and has a seating capacity of 26 passengers. It is mounted on the latest improved form of "Tackaberry" truck as made by the John Stephenson Company, and is furnished with the Stephenson improved ratchet brake, and improved trolley bridge, which does not come in contact with the roof, except at the end walls, where it is supported between rubber cushions. The cars have ample platforms with the bonnets supported at the corners by substantial posts. These complete Stephenson cars are equipped with General Electric Company's motors all ready for service upon the tracks. The well-known Boston trolley is used. It is claimed for these cars, that they are the easiest and most comfortable riding, because of the use of super-spring running gear, and the most efficient cars for electric service now in use.

NEW BLOCK SIGNAL SYSTEM.

On the afternoon of May 23, a party of representatives of railway and electrical journals went to Weehawken, N. J., to witness the practical operation of a new block signal system in the Weehawken tunnel of the West Shore Railroad. The apparatus is the joint invention of W. G. Wattson, Division Superintendent, and Joseph B. Stewart, Superintendent of Telegraphs and Signals of the West Shore road, and these two gentlemen accompanied the party into the tunnel and explained the operation of the system in every detail.

The plant now in operation in the Weehawken tunnel is an experimental one, and has proved in practice to be very reliable in its operation. The system, moreover is remarkable for its simplicity.

The main feature of the system consists in the employment of electric lamps placed along the track about on a line with the vision of the engineer as close together as desired. In the Weehawken tunnel they are placed about 100 feet apart. The lamps are normally lighted, which condition indicates safety and a clear track. Therefore, when an engineer sees the lamps burning ahead of him he proceeds, the burning lamps indicating that the section ahead of him is clear. On the

(*Continued on page 349.*)

(*Continued from page* 341.)

cal Supplies, Rutherford. N. J., and New York city.

Fred. Sheffler, Agent, Stirling Boiler Co., 74 Cortlandt street, New York city.

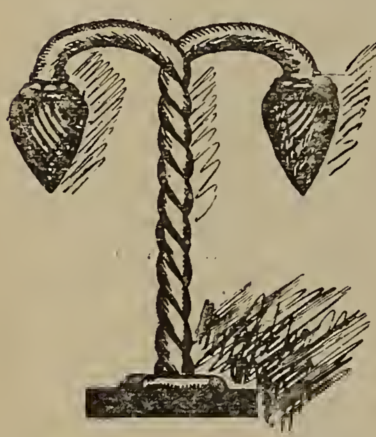
George C. Sonn, Instructor in Physics, Newark High School, 285 Bellevue avenue, Newark, N. J.

Alfred E. Wiener, Electrical and Mechanical Engineer, General Electric Co., 24 Yates street, Schenectady, New York.

Peter Wright, Inspector of Electrical Works, United Gas Improvement Co., C. Drexel Building, Philadelphia, Pa.

V. H. Yarnall, Superintendent of Construction, J. G. White Co., 29 Broadway, New York city.

THE W. C. VOSBURGH MFG. CO., L'td.



THE electric light, more than any other method of lilumination, has offered opportunities for the exercise of artistic taste and ingenuity never dreamt of a few years ago. It was soon perceived that the electric light, on account of the extreme flexibility of application, would readily lend itself to artistic development, and the result has been remarkable. The light itself of course has undergone no change, but the fixtures to which the lights are attached have, andthe development along this line has been truly wonderful. True, before the introduction of electric light, handsome gas fixtures were produced, but they were as nothing compared with the exquisite fixtures made now-a-days to embellish our theatres, hotels, clubs and private houses, with the aid of electric light.

A visit to the show rooms of the principal manufacturers of these fixtures tells a story that can hardly be expressed in words. Here and there and everywhere are seen fixtures of all sizes, designs and finish, side brackets, newell posts, electroliers and fixtures of every conceivable shape to meet any possible condition of use. Such a showroom is an embodiment of the art of fashioning metals, and the beautiful designs seen on every hand give evidence of the vast amount of effort put forth and expenditure to satisfy the public taste for elegant things.

It was our good fortune recently to be accorded the privilege of visiting the factory and warerooms of the W. C. Vosburgh Manufacturing Company in Brooklyn. Under the charge of Mr. H. C. Beck, the president of the company, we were conducted through every department of the vast establishment, and we must confess we were surprised at the magnitude of this concern.

As is well known, the W. C. Vosburgh Mfg. Co., manufactures gas and electric light fixtures, and the elegance of its goods, both as to design and finish, is a matter of common knowledge in the trade. The company's warerooms, office and factory are at Nos. 269–281 State street, Brooklyn, one of the most convenient localities in the city for such an establishment, and at the same time within easy reach of the class of buyers who seek elegant things in the fixture line.

We give herewith an exterior view of the company's factory and warerooms, (Fig. 1) The total frontage of the buildings is 175 feet. The factory proper has 125 feet front, and was built in 1887. It is of brick and brown stone and six stories high. The warerooms are in the newer building, the nearest one in the illustration. The warerooms building, which was erected in 1892, has a width of 30 feet, is five stories in height and constructed of Philadelphia brick with terra cotta trimmings. This building is separated from the factory by a space of 20 feet, but the two are connected on various floors by tramways and bridges. The space between the two buildings is built up one story on the ground for the offices of the company, that above being utilized as a light well. At the rear of the warerooms building is a wing 25x20 in size built up the full five stories, which also forms a part of the warerooms.

In order to expedite business, and facilitate prompt attention to orders, the office is connected with the various departments by pneumatic tubes- Orders are thus transmitteed to the department to which they belong in an instant, thereby insuring their prompt execution. The entire five stories of this building are devoted to wareroom purposes, for the proper display of the great variety of fixtures manufactured by this company.

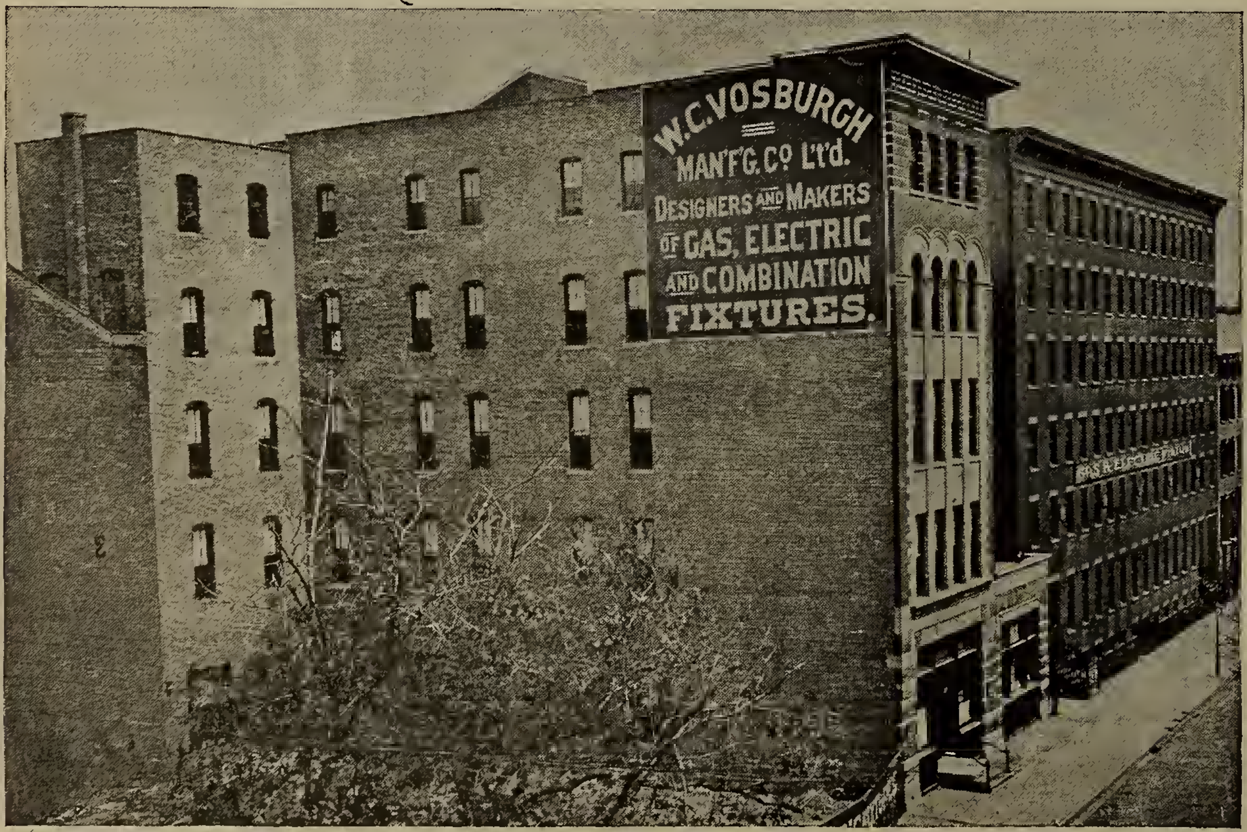


FIG. I.—VIEW OF FACTORY AND WAREROOMS.

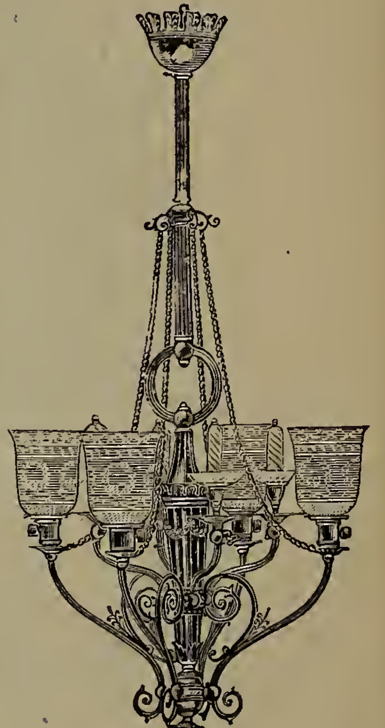


FIG. 4.

The company's plant is modern in every respect, everything mechanically and otherwise being of the most approved form, and every appliance for facilitating the transaction of the business being introduced.

Another illustration (Fig. 2) gives a view of one of the five floors of the warerooms, but it is evident that no picture can do justice to a subject of this character. There are so many electroliers, fixtures, etc., shown that all the beauty of any one is entirely lost in the mass. To compensate for this loss, however, we also give a few illustrations of individual fixtures of different designs, which we shall refer to more extensively later on.

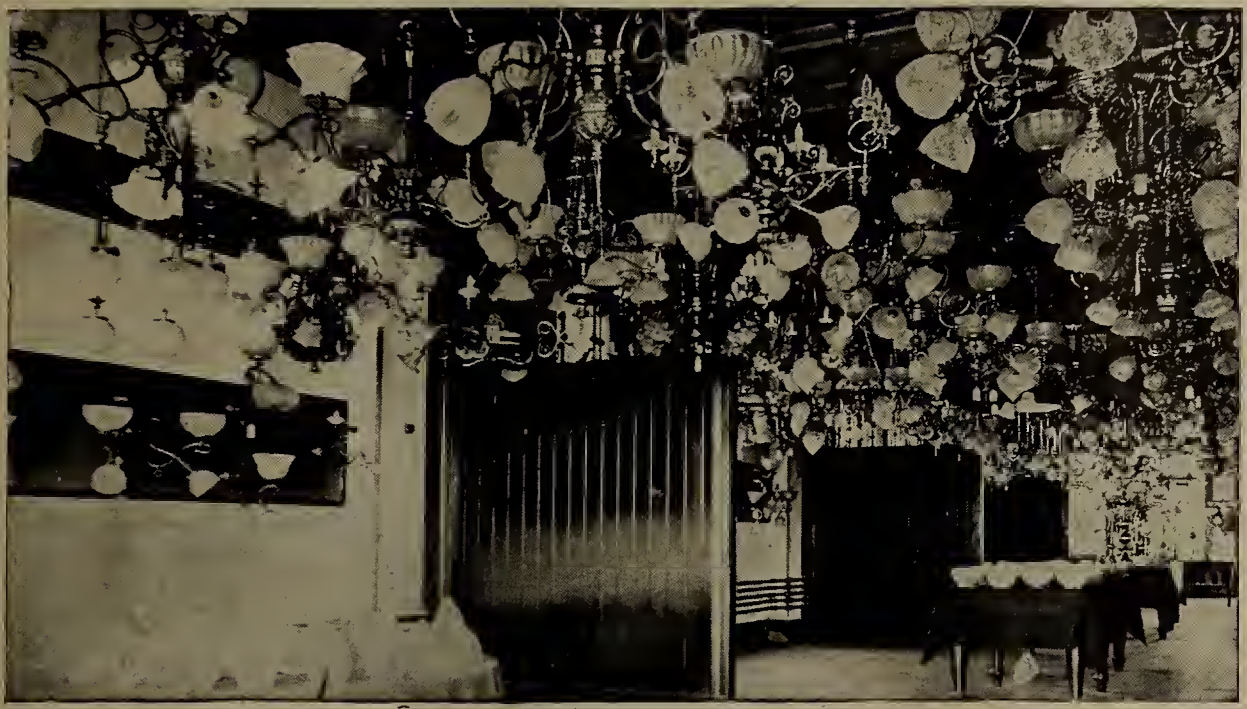


FIG. 2—VIEW OF ONE OF THE WAREROOMS.

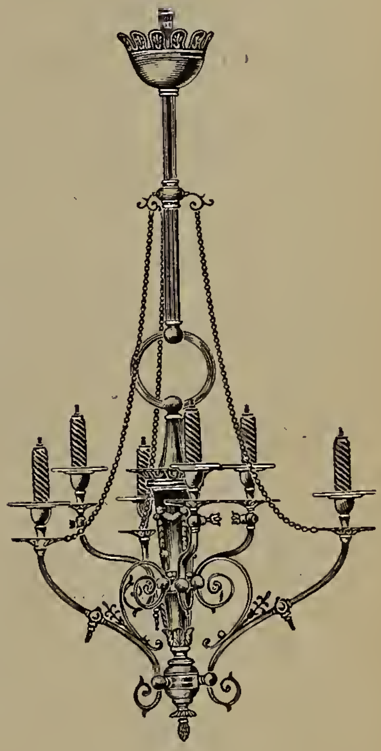


FIG. 5.

Each of the five floors of the warerooms' building has an area of 30 x 90, with an additional space of 25 x 20 feet in the wing above referred to. The wings on each floor are used for the display of goods of special design. The main floors of the warerooms are divided by grill work partitions of cherry, mahogany and cocobolo. In each of the spaces thus divided off goods of a particular grade are displayed, with the object of facilitating selection. The warerooms are lighted by day by large windows on all four sides of the building, and artificially by gas and electric light. The floors are of highly polished wood.

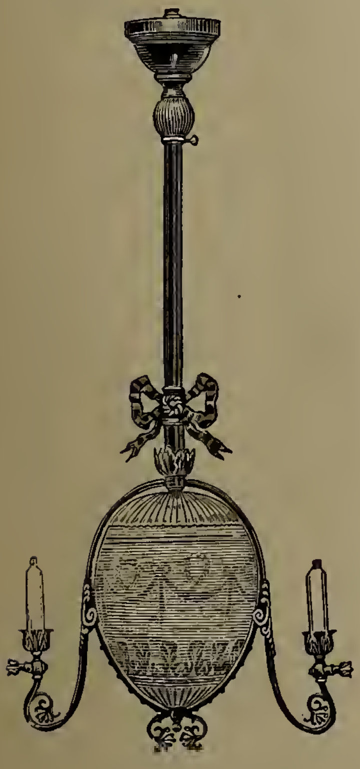


FIG. 6.

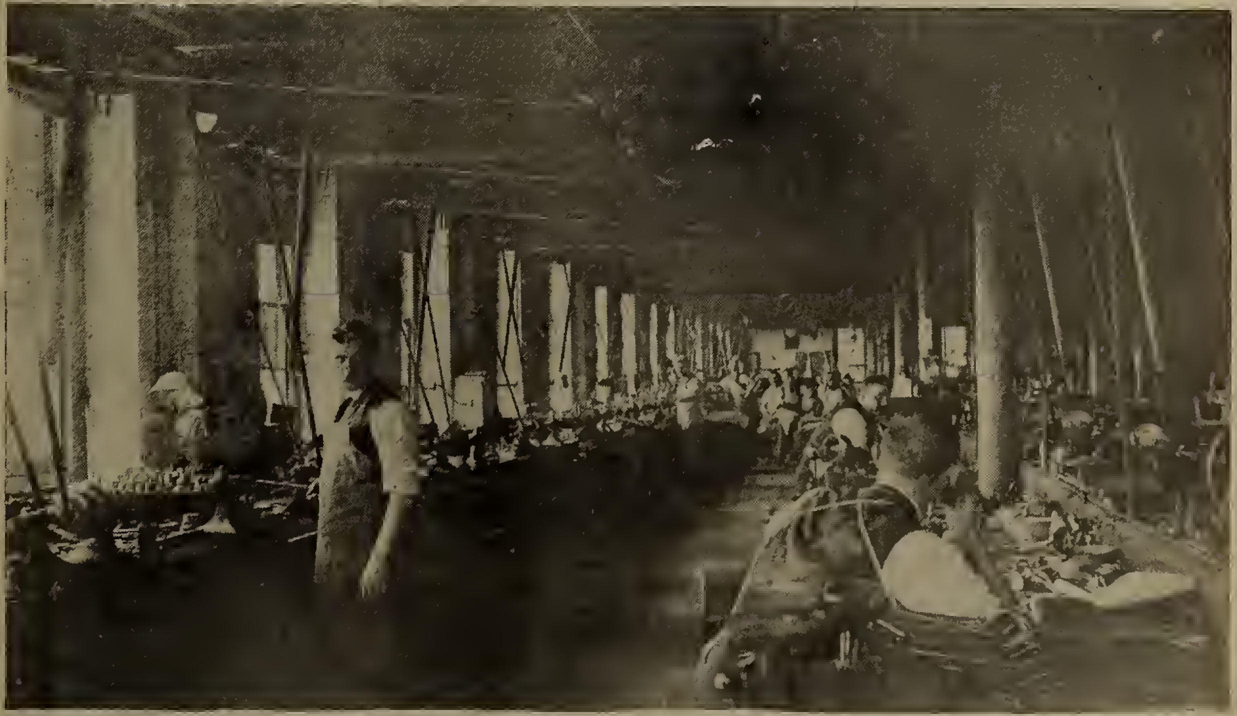


FIG. 3—VIEW IN THE FACTORY.

Fig. 3 gives a view of one of the six floors of the factory, everyone of which is a veritable hive of industry. This photograph was taken during the noon hour, when all the men were eating lunch, the object being to avoid the vibrations caused by the operating machinery. Every machine has its attendant, and during working hours the scene is an interesting and busy one. What is true of this floor is true of all.

The company employs no less than 250 men in all its departments, and they are a satisfied looking lot of operatives. The Vosburgh Company's manufacturing plant, in short, is modern in every particular. The latest improved machinery and appliances are found here, which with the conservative business policy of the company tells the story of the company's success.

The products of this company are celebrated all over the country for quality, design and serviceability. Indeed, the reputation the company enjoys is not confined to the United States; its goods are equally well known in Cuba and South American countries, where this company's fixtures are extensively used.

The prevailing style of fixtures is known distinctively as the "Empire." Empire fixtures are graceful and beautiful in design, and cannot fail to satisfy the most exacting taste.

There are a great many modifications of this style, and for the purpose of giving our readers an idea of the beauty of these fixtures we give herewith a few illustrations of the same.

Fig. 4 shows a combination gas and electric chandelier, of pure Empire style, and Fig. 5 shows an Empire fixture for gas only.

Fig. 6 represents a vestibule light of the same style. The shade in the centre is of beautiful etched glass, giving a rich effect when illuminated. Lamps of this design are placed in the boxes of the Empire Theatre, New York city, which theatre was furnished throughout with fixtures on the Empire style by the Vosburgh Company.

A beautiful combination and electric Empire chandelier is shown in Fig. 7. This is somewhat different in design to that shown in Fig. 4. The graceful curves of the various parts combined with beautiful lamp shades produce a handsome effect.

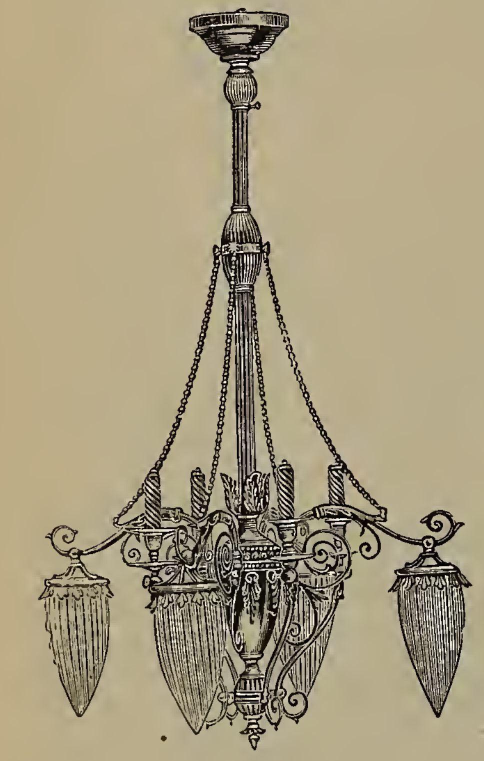


FIG. 7.

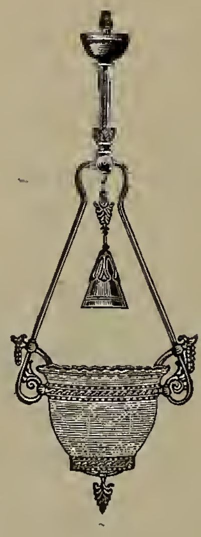


FIG. 8.

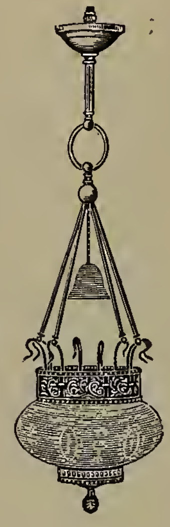


FIG. 9.

Mr. H. C. Beck, the president of the company, is well known in the trade all over the country, and it is but fair to state that the company's success is due largely to his management. The other officers of the company are John Nix, vice-president; F. L. Strickland, treasurer; Charles H. Littlefield, secretary.

The company has a large branch in Chicago, Ill., at No. 184 and 186 Wabash avenue, which supplies the trade in the west, south and northwest.

Two artistic hall lanterns are illustrated by Figs. 8 and 9. These, also, are of the same prevailing style and can be used for either gas or electricity.

The five floors of the warerooms are filled with fixtures of this general character, the variety being so great that at first glance is bewildering, but when any one is studied by itself the beauties of design and workmanship are at once revealed.

The city government of New Orleans will soon offer for sale the franchises now operated by the leading street car company of the city with which the contract is about to expire.

REGULATION OF A COMPOUND DYNAMO.

A short explanation of the regulation of a compound dynamo might prove of interest, although the general principles governing it are quite well known. Let us take a bi-polar machine with the high resistance field coils placed in shunt across the brushes and the low resistance field coils in series with the brushes and the external circuit. No current passes through the series coil until the external circuit is closed so that the shunt coils alone excite the field magnets. The voltage of the open machine when running at the normal speed should be the constant voltage desired on the line.

On closing the external circuit the current in the armatures is increased, thus the voltage of the machine is lowered, caused by the armature losses. But now current flows through the series field coils which strengthen the field thus bringing up the voltage to the proper point. In a correctly compounded machine the series coils should effect the magnetism of the field magnets to such a degree as to keep a constant voltage with all currents that can be safely used. If there are more series coils in proportion to the shunt coils than should be the case, the increase in voltage due to the magnetism of the series coils will overpower the drop in the voltage due to armature losses, so that the voltage will rise as the current up to a certain limit. In the case of too few series coils, the armature losses will be greater than the increase of voltage due to their increased magnetism. Thus the terminal voltage will be lowered on increase of current. To get the proper ampere turns in the series coil, a shunt is placed across its terminals so as to vary the proportional amount of current flowing in them.

CONVENTION OF RAILROAD TELEGRAPH SUPERINTENDENTS.

The Association of Railway Telegraph Superintendents will hold its annual convention at the Plankinton House, Milwaukee, Wis., on June 20, next. Mr. P. W. Drew is the secretary of the association, his address being 535 67th street, Chicago, Ill. The Committee of Arrangements consists of M. J. Fry and H. C. Reed, of Milwaukee, and H. C. Hope, of St. Paul, Minn.

FINANCIAL EMBARRASSMENT.

A dispatch from Eau Claire, Wis., states that Ralph E. Rust was on May 23 appointed receiver of all the property of the National Electric Manufacturing Company. The company's assets are said to be about $560,000, and the indebtedness about $400,000. This company was one of the largest electrical manufacturing companies in the United States. Threatening suits arising out of the stringency of the money market is said to have been the cause of the company's embarrassment.

EUROPEAN CENTRAL STATION.

Mr. William S. Barstow, superintendent of the Edison Illuminating Company, Brooklyn, on the evening of May 19, delivered a lecture before the department of electricity of the Brooklyn Institute of Arts and Sciences. Mr. Barstow took as his subject "The General Character of some European Central Stations." It was an extremely interesting discussion and was attentively listened to by the audience.

Some of the officials of the Coney Island Railroad state that the Johnson-Lundell motor car recently tried on their road made an excellent record for its promoters. It proved an efficient machine.

(*Continued from page* 345.)

other hand should he find the lamps ahead of him extinguished he stops, as it indicates that the section ahead is not clear.

While this system is applicable to any part of a railroad, the automatic device, which has been successfully tested, is especially adapted for the quick movement of trains through tunnels under conditions of absolute safety. By its use the capacity of a tunnel 3,000 feet long, or longer, can be doubled, or still further increased in proportion to its length. The Weehawken tunnel is 4,200 feet long, and the lamps have been placed to divide it into two sections. This doubles its capacity for the movement of traffic as compared with the old system of a block office at either end, and allows but one train in the tunnel at a time going in one direction. A train entering the tunnel at the east portal puts out all the lamps outside of the tunnel (the lamps are strung for 500 feet outside) and for 300 feet inside; also every alternate lamp for 900 feet further in the tunnel. The overlap lamps which alternate with the lamps in the first section, are left lighted for the train to run on to a point 2,300 feet inside, where the lamps in the second or middle section are put out, thus producing a dark or shadow section of 1,100 feet immediately behind the train, which is maintained until the train passes out of the tunnel at the west end. At the same instant that the lamps in the second, or middle, section are put out, those in the first section of 1,200 feet are lighted, so that when the train has reached a point of 2,300 feet in the tunnel, the signal to proceed is displayed at the east end of the tunnel for a following train. When the train passes out of the tunnel at the west end, the lamps in the middle section are lighted. This is all done automatically by the train passing over an electrically connected track circuit, all the parts of which are very simple and can be understood and maintained by any ordinary telegraph lineman.

The track instrument is shunted out of circuit by the wheels of the train and when the last pair of wheels pass out of the section the instrument circuit is again cut in. This instrument operates another which cuts out and in, or shunts, the signal lamps. This latter instrument is very simple and ingenious in design and very effective and reliable in operation.

The system is so arranged at Weehawken that the electric light circuits pass through the signal tower, from which the old semaphores are worked, and a lamp connected with each circuit in the tunnel is displayed, so that the operator can tell at a glance the whereabouts in the tunnel, of a train. By opening a small switch he can put out the lamps in any section and stop any train; or he can put out all lamps and stop all trains.

This system not only doubles the capacity of a tunnel, and provides for the control of trains anywhere in it, but gives to the engineer, conductor and trainmen a *constantly* visual signal for the movement of the train. It will not be necessary for the engineer to reduce speed when approaching the end of a block section, expecting there to find the signal against him, as the dark section of 1,200 feet, or more, gives ample space to stop.

Under the present system of blocking, with one signal at the ends of the block sections, an engineer is liable to overlook or mistake the signal, especially when smoke or fog is thick and there is no way provided to stop the train after it passes the home signal, but, as stated before, with the new system the signal to stop can be given at any tme, by the operator cutting off the current from the lamps. These features are so very different from anything on record that the Patent Examiner-in-Chief, in allowing the broad claims, made the following report :

"The essence of the matter claimed is the normally lighted block sections in a railway tunnel arranged to be automatically extinguished on the block immediately behind the section on which the train is running, so that the train is virtually followed by a dark section or shadow into which it is dangerous to run a following train, and so understood. This is a very efficient safeguard and provision to prevent closely following trains from running into those preceding, and far superior to the former method of depending on lights of peculiar color, shape or movement to indicate danger. The device of conception thus has merit in proportion to the immense interests of the public welfare thus promoted. Claim 1, relates *broadly* to such a device. It is evident that the specific means for extinguishing and re-lighting the electric lights, which normally illuminate the tunnel, may be varied indefinitely by the well-known resources of the electrician."

The instrument used to automatically cut off the electric light current can be worked with three cells of gravity battery and does its work without any sparking. Another system is so arranged that if any part is broken or disconnected the danger signal is displayed.

This system possesses features of the utmost importance and value, and it was declared by all present at the exhibition test to be a great stride in the direction of securing absolute safety to trains under the conditions named. From its simplicity it cannot fail to be reliable in operation, and it looks as if Messrs. Wattson and Stewart had practically solved one of the greatest problems that railroad men have ever had to deal with.

NOTES OF GENERAL INTEREST.

Several hundred incandescent lamps in San Francisco were recently destroyed by a sudden rise in the line voltage of from less than 115 to over 150 volts. The glass bulbs were broken and in most cases the carbon filaments were burned away. The machines at the station were running at about normal speed, when suddenly the indicators gave notice of a greatly increased voltage. Means were taken at once to reduce this by the use of the regulating rheostat, but to no effect.

A company for the purpose of carrying on a general telegraph and telephone business in the vicinity of San Francisco has been incorporated. It is called the Merchants' Telautograph, Telephone and Telegraph Company. The capital stock is $5,000,000, of which $750,000 has been subscribed. The directors are G. C. Perkins, J. B. Stetson, W. F. Whittier, J. D. Spreckels. Louis Sloss, A. E. Brook Ridley and C. W. Cross. The company expects to construct nearly 200 miles of telegraph and telephone lines within the county of San Francisco.

A telephone line from Oregon City to Portland has been constructed by the Portland General Electric Company. A special cable has been made for this purpose, because of the induction due to the electric power circuit between the two cities. The cable consists of six heavily insulated wires; the whole being enclosed in a casing of lead. The wires are twisted in pairs. Three metallic circuits are formed by them.

The Utica Subway Company of Utica, N. Y. has been incorporated, to construct, excavate and maintain subways, ducts and conduits for laying, containing, holding and conducting telegraph, telephone, electric light, fire alarm, police and other wires, and electrical conductors underground, in the streets and highways of the city of Utica.

The People's Electric Light and Power Company of Creston, Iowa, has secured a contract from that city for thirty 2,000 candle-power lamps for a term of five years.

QUESTIONS AND ANSWERS.

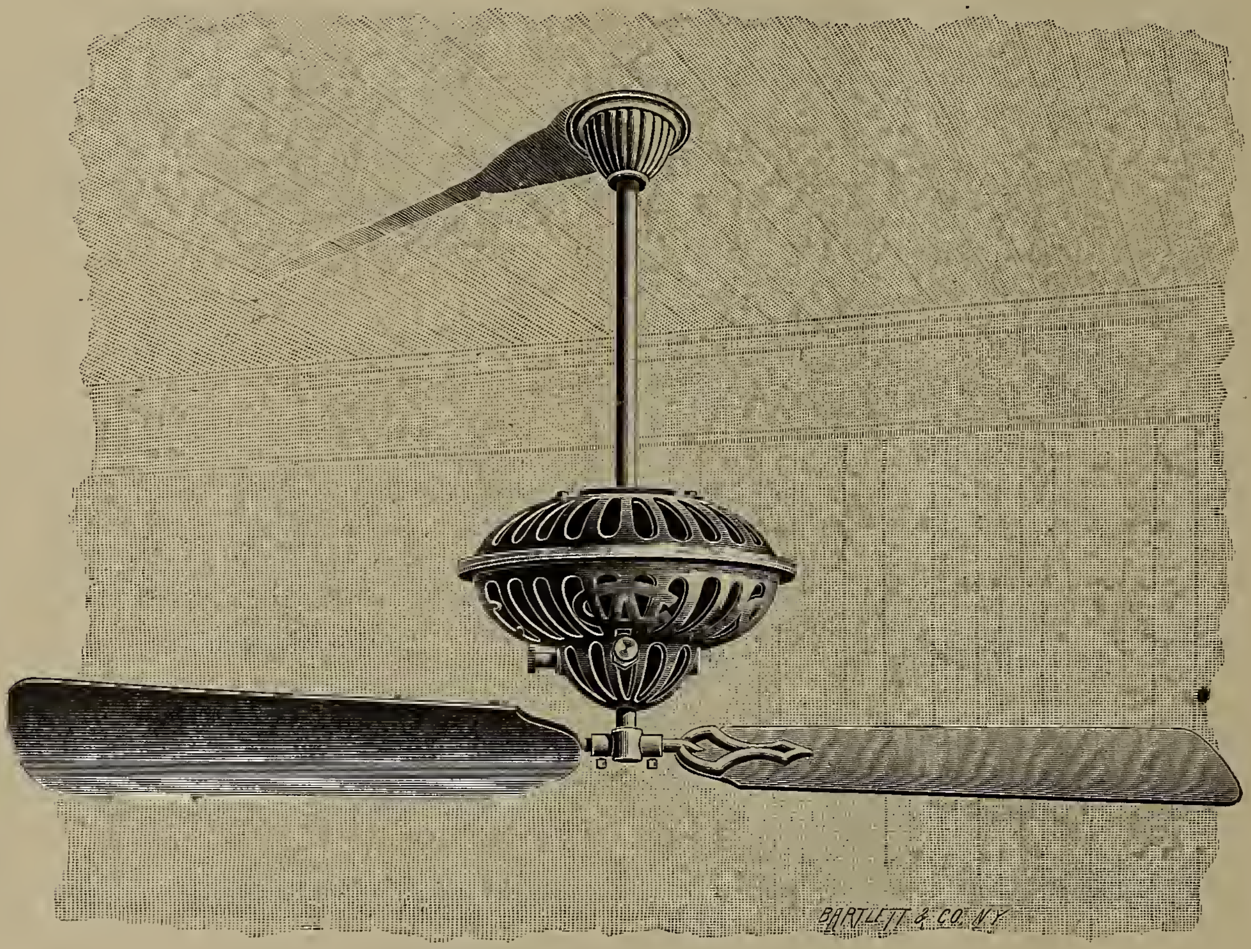
Correspondence from practical men upon topics of interest relating to electricity and kindred subjects, will find a place in this department.

The publishers, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Our readers are invited to avail themselves of this department when desirous of seeking or imparting information on questions of general interest.

NEW CEILING FAN MOTOR.

The Crocker-Wheeler Electric Company, of New York city, has just brought out a ceiling fan which will likely meet with a large demand on account of the desirable features it possesses.


BARTLETT & CO. N.Y.

CROCKER-WHEELER CEILING FAN MOTOR.

This fan is shown in the accompanying illustration. It is very handsome in design, and compact, and it can be regulated for any height of ceiling. It is claimed to be the best and most substantial device of the kind ever manufactured. It is provided with ball and anti-friction bearings, consequently requires no oiling.

The motor which is contained in the basket is very compact. The motors are wound for all voltages up to 250 volts, and two such machines may be connected in series on a 500 volt circuit.

The motors are provided with automatic carbon brushes.

THE CRUISER NEW YORK'S ELECTRIC GIG.

The General Electric Launch Company of New York is building a gig for the commanding officer of the Cruiser " New York " Her length will be 30 feet at the water line, beam 6 feet, 10 inches and draft 22 inches. She will be capable of a speed of six or seven miles an hour for a period of five or six hours, with one set of storage batteries, although she can make faster speed in a less number of hours.

The motor is placed under the floor of the cock-pit, and is directly connected to the Tobin bronze propeller shaft. Current is supplied by 64 storage batteries distributed under the seats and flooring.

The launch is built with a high free board to keep the cock-pit dry in rough waters. Much interest is taken in this launch's motive power, and it is expected that a series of tests will be made to determine its economy as compared with other motors.

LUNDELL FAN OUTFITS IN A THEATRE.

Amusement seekers during the hot summer months will appreciate the liberality of the management of the Fifth Avenue theatre, and actors will bless it when they feel the cooling zephyrs that make the theatre a delightful resort. This invisible, inaudible delight is the result of experiments with a fan motor outfit. The Lundell outfit was chosen, particularly on account of its noiselessness. The boxes will have each an individual outfit and there will be a plentiful distribution of fans throughout the auditorium, stage and dressing rooms. The Interior Conduit and Insulation Company whose wiring system is installed in the building, furnished the Lundell fan out.

The General Electric Company has taken the article which appeared in the *Forum*, of February, 1893, giving an extremely interesting history of that company and its work, and republished it in brochure form. It makes up a very artistic and attractive litte work. It is very fully illustrated, and the story is a very interesting one.

INSTITUTE PAPERS.

On account of the extraordinary press of other matter we have been compelled to omit from this issue abstracts of some of the papers read at the general meeting of the American Institute of Electrical Engineers on May 17 last. They will appear in our next issue.

SPECIAL REPORTS.

The matter under this head is prepared for the special information of manufacturers of electrical apparatus, engineers, contractors, supply dealers, etc., and is entirely new.

NEW CORPORATIONS.

Albany, N. Y.—A syndicate has been formed in New York with a capital of $4,000,000 for the construction and equipment of a line between Niagara Falls and Albany for the transmission of electric power generated by the Niagara Falls power company.

Ashland, Wis. — The Ashland Terminal Railway company has been organized and is soon to begin on the belt line.

Florence, N. J. — Articles of incorporation for the West Jersey Traction Company have been filed. The capital stock of the corporation will be $3,000,000, divided into 30,000 shares of $100 each.

Omaha, Neb.—Articles of incorporation have been filed by the East Omaha Street Railway Company. The capital stock is $1,000,000, half of which is subscribed. The incorporators are John Lowber Welsh and E. T. Statesbury of Philadelphia, George W. Holdredge, Henry W. Yates, and A. S. Potter of Omaha.

Pueblo, Col.—The Union Street Railway company has filed articles of incorporation. The company will operate a street railway in Pueblo and Bessemer. Capital stock, $100,000. Directors: G. E. Bragdon, J. T. Higgins, O. W. Mallaby, C. F. Ray and E. J. Wilcox.

Rochester, N. Y.—The articles of incorporation of the Rochester and Irondequoit Railroad Company have been filed. It is understood the capital of the company is $1,000,000.

Warwick, R. I. —An act to incorporate the East Greenwich and Warwick Electric Railway Company has been passed.

POSSIBLE CONTRACTS.

Arlington, Cal.—The question of substituting electricity for mules as the motive power to propel the Arlington street tramway is being agitated again.

Bradford, Pa.—The Bradford and Kendall Railway Company proposes to use electricity as a motive force.

Grand Island, Neb.—The transfer of the old street railway property has been effected and everything turned over to the Electric Transit, Light and Power Co., and the following officers elected: G. R. Furr, president; W. H. Thompson, vice-president; E. G. Stolley, secretary; A. S. Vest, treasurer. Work is to commence at once on changing the line from a horse to an electric system.

Salem, Neb.—The Roanoke-Salem dummy line will give way to an electric street car line.

San Francisco, Cal.—An electric system for the street railway lines at Riverside is projected.

Woonsocket, R. I.—Work was commenced recently on preparing the street railway for electric power.

A claim on Nisqually Falls has been filed by citizens of Tacoma, Wash., and a company is to be formed to expend $400,000 in building a power-house and machinery to use the power of the falls in running electric plants in Tacoma. The figured strength of the falls is 10,000 horse-power, about half as great as that of the famous Snoqualmie Falls.

NEW YORK NOTES.

Office of the Electrical Age.
First Floor, World Building,
New York, May 27, 1893.

The Mason Electric Company, of 10 and 12 Vandewater street, has been bought out by Mr. A. Van Derwerken who is now president and treasurer of the company. Mr. J. H. Mason is vice-president, general manager and electrician, and Mr. F. B. Johnson is secretary. The Brooklyn office is in the Real Estate Exchange Building, 189 Montague street. The company manufactures the Mason battery which has had a successful run of trade for the last ten years. The company also sells and installs these cells for running motors for all kinds of power and lighting work, such as horse cars, houses, etc. The company proposes to propel a street car by means of this battery. The company will carry a full line of electrical supplies of all kinds to use in connection with the Mason battery. Mr. Mason is becoming celebrated as a lecturer in Brooklyn, his lectures being very popular. He claims that four years ago he caused an incandescent lamp to become luminous by static electricity, he holding the lamp in his hand.

We have received copies of two handsomely gotten up catalogues just issued by the Interior Conduit and Insulation Co., of 44 Broad street, city. One of these is devoted entirely to the Lundell motors and its applications. Many handsome illustrations are given of the details, motors complete and combined motor-fans, etc. These compact, highly finished motors have been applied to a great many uses in the fan and power line. The other book contains illustrations and descriptions of the company's conduits, junction-boxes, insulators, etc., as well as of its well-known electrical goods and specialties.

Mr. G. H. Stockbridge, the well-known electrical expert and patent solicitor, is now located at 39 Cortlandt street, city.

Frederick Pearce, 79 John street, city, manufacturer of telegraph and fire alarm apparatus and special electrical machinery under contract, has been taking account of stock and clearing up accumulations of apparatus. He has in stock a large and varied line of electrical apparatus which he will dispose of at a bargain.

A. H. Ryder & Co., Electrical Engineers and Wiring Contractors, 180 Broadway, city, are the manufacturers of all kinds of electric fans and power motors. They make a variety of forms and mountings for their fans so as to render them available for use in all places.

Mr. Ralph Shainwald, president of the Standard Paint Company, 2 Liberty street, city, the well-known manufacturer of P. & B. compounds has started for Chicago to view the Fair and to see that the P. & B. compounds are prominently displayed in the Electricity and Manufactures Buildings.

Pattison Bros., 136 Liberty street, city, consulting and supervising electrical engineers, have in charge the building of an electric railway plant at Rahway, N. J. The road is at first to be 2½ miles long, but it is proposed to extend the line to Boynton Beach, Staten Island, seven miles distant.

Mr. T. J. Murphy, the noted slate switchboard manufacturer of 136 Liberty street, city, has been refitting his office with a beautiful line of samples of marble and slate. On one side of the office is placed some large slabs of slate finished in handsome onyx and Numidian marble and on shelves are arranged a great variety of small samples in all kinds of coloring and graining. Mr. Murphy is building several large boards; one is 11 by 8 feet, made in three pieces. The centre piece is 8 feet by 4 feet 4 inches and is of solid pink Tenessee marble.

Mr. Murphy is doing all the drilling in the iron frame work and placing the board in position, in the new Metropolitan Club building, 60th street and 5th avenue, city. Another marbleized slate switch-board, for the new *Herald* building, 12 feet by 7 feet 6 inches, finished in imitation of Egyptian marble is being bored, the iron frame work constructed and is to be installed by Mr. Murphy. He is also drilling and finishing the iron frame for a Tennessee marble board 16 feet by 6 feet, in four pieces, to be installed by him in the lunatic asylum in Johnstown, Long Island. These boards are said to be the largest, handsomest and best mounted, ever put up in this city.

Mr. Robert L. Hailey will represent the Eddy Electric Motor Co, of Windsor, Conn., at its New York office during the absence of Mr. Ross, the New York manager who is in Chicago looking after the company's exhibit at the World's Fair. Mr. Hailey has had large experience and looks after the installation of motors and dynamos in this vicinity. The New York office is at 1212 Havemeyer building.

The Susquehanna Valley Traction Company has secured a franchise after a long struggle, much credit being due to Hon. A. C. Wade, the secretary of the company, for the manner in which he routed the enemy. He was assisted in his work by the president of the company, Mr. A. N. Broadhurst, who is also president of the Jamestown Street Railway Company, Jamestown, N. Y., and Mr. H. B. Oakman an untiring worker. Mr. Oakman is placing orders for the entire equipment of this electric road, which will connect the towns of Waverly, N. Y., Sayre and Athens, Pa. Mr. Oakman's headquarters are at the office of C. D. Shain, 136 Liberty street, city. He was, up to a short time ago, the manager of the Edison General Electric Company's supply house in Buffalo, N. Y., where he made a large number of friends.

The writer met Mr. A. Rockoff, the electric light engineer. He reports that he has done a big business during the past winter and spring; he has also taken several large contracts at Rockaway Beach. Among the new buildings erected there since the fire last year Mr. Rockoff has his office at the Central Hotel, 146 and 148 Liberty street and 102 West street, city.

Gooding, Bienert & Co., formerly of 80 John street, have removed to 126 Elm street, where they manufacture Leclanche batteries and general electrical goods.

Bagnall and Hillis are the agents in Japan for the New York Insulated Wire Company, maker of the noted Grimshaw White Core wires, etc. They also represent the Brush Electric Company. Their headquarters are in Yokohama.

Mr. H. H. Hayden the genial head of the Law Battery Company has made a big success of the Law cell as well as the company's electro-medical specialties. The medical cabinet built under the supervision of Mr. Hayden, is the most complete article in its line, meeting all the requirements of medical men.

Mr. Misel has reorganized the Barr Electric Co., which had its place of business at 19 Broadway, the title of the new concern being the "Universal Electric Co." The office of the new company is at 294 Broadway.

It is reported that Dr. P. H. Van der Weyde, so well known to the electrical fraternity, is lying very ill at his home in Duffield street, near Fulton, Brooklyn.

The Aluminum, Brass and Bronze Company of which T. C. Fowler is manager, has moved from the Stewart Building to 55 Fulton street, corner Cliff street, city.

Mr. F. De Ronde, of the Standard Paint Company, No. 2 Liberty street, is responsible for the large sales of this company's goods, his able management having brought P. and B. to the front.

Mr. James H. Mason, the inventor of the well-known Mason primary battery, has recently opened a place at Stuyvesant avenue and Fulton street, Brooklyn. Mr. Mason is engaged in contracting and jobbing in electrical house work, and carries a line of general electrical supplies. He is also manufacturers' agent, and sells and rents Edison phonographs. He has had 19 years of experience, and does only first-class work. Mr. Mason will deliver a lecture on "Electricity" at the Pilgrim Baptist Church, McDonough street and Patchen avenue, Brooklyn, N. Y., on the evening of May 31, at 8:15 o'clock.

The McIntire Co., 15 Franklin street, Newark, N. J., is meeting with an extraordinary call for heavy feed wire connectors for electric railway work, terminals for solid and stranded under T's and straight sleeves for underground connections. The latter are being used exclusively for underground and concreated work at the World's Fair. W. T. H.

TRADE NOTES.

We have just received a handsomely illustrated copy of the catalogue of the National Water Tube Boiler Company just issued. The book shows several views of the various sections and details of the company's boiler as well as the claims for their economy, durability, etc.

We are in receipt of a copy of a neat, finely illustrated catalogue just issued by the Railway Equipment Company, Pullman Building, Michigan avenue, Chicago, Ill. Within its 208 pages it illustrates the electric railway supplies, for all systems, for sale by the company. Besides containing a description of the various devices for sale, the book contains valuable wire tables and an article on electric railways.

The Steel Motor Company, of Cleveland, O., successor to the Johnson Electric Co., manufacturers of the "Steel Clad" railway motors, has received the contract from the Lehigh Valley Traction Company, Allentown, Pa., for furnishing motor for its entire car equipment. The company's factory is working night and day to fill the large orders, for Harris trolleys and general supplies.

The Elektron Manufacturing Company, of Springfield, Mass., manufacturer of the Perret electric motors and dynamos, report a lively demand for its improved electric elevators. The company has recently established an office at 103 Milk street, Boston, and has stationed there, Mr. E. Marshall as manager of the elevator department and Mr. F. B. Corey as manager of the electrical department. Mr. Marshall has had a long experience in the elevator business in connection with the Otis & Graves hydraulic and power apparatus. The Boston office has recently installed electric elevators for Messrs. Curtis & Bolster, 2,304 Washington street, Boston, and Frank Ferdinand, 2,280 Washington street, Boston. The company's electric elevators have recently been installed in Masonic Hall, Springfield, Mass.; Brown, Thompson & Company's dry goods store, Hartford, Ct., and in the store of W. H. King & Son, paper dealers, Springfield, Mass., the latter being the second order.

A. & F. BROWN.

Among the prominent manufactories located near New York city is the pulley, hanger and shafting establishment of Messrs. A. & F. Brown, at Elizabeth, N. J. The principal trade of this concern is in pulleys, though their patent hangers and superior cold rolled shafting are well known and in general demand throughout the United States. The works at Elizabeth cover two acres of ground and consist of a machine shop and foundry, each 60x150 ; pulley and blacksmith shops 50x150 ft ; and pattern loft, 50x200 feet. These buildings are substantially built of brick, are well lighted and ventilated, and supplied throughout with all the latest improved machinery and appliances for the thorough and economical manufacture of the firm's specialties. Felix Brown, Jr., is the general superintendent. The firm employes over 200 workmen. The New York office is at 43 Dey street.

The Electrical Age's Illustrated Record of Patents.

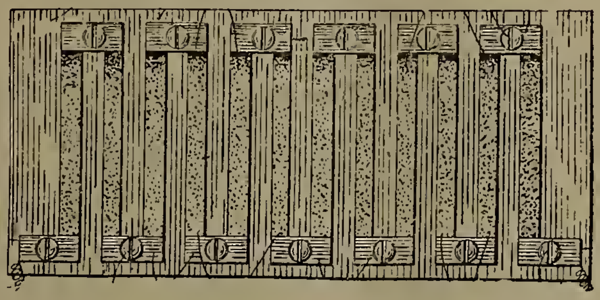
Issued May 23, 1893.

497,771. Electric Heater. Samuel M. Cook, Boston, Mass., assignor to the American Electric Heating Company, same place. Filed Jan. 17, 1893.

497,791. Electric Radiator. Samuel B. Jenkins, Boston, Mass., assignor to the American Electric Heating Company, same place. Filed Nov. 25, 1892.

497,792. Electric Flat-Iron Heater. Samuel B. Jenkins, Boston, Mass., assignor to the American Electric Heating Company, same place. Filed Dec. 5, 1892.

497,793. Electric Soldering-Iron. Samuel B. Jenkins. Boston, Mass., assignor to the American Electric Heating Company, same place. Filed Dec. 5, 1892.



497,795—ELECTRIC HEATER.

497,794. Electric Heater for Flat-Irons or Other Articles. Samuel B. Jenkins, Boston, Mass., assignor to the American Electric Heating Company, same place. Filed Dec. 5, 1892.

497,795. Electric Heater. Samuel B. Jenkins, Boston, Mass., assignor to the American Electric Heating Company, same place. Filed Dec. 8, 1892.

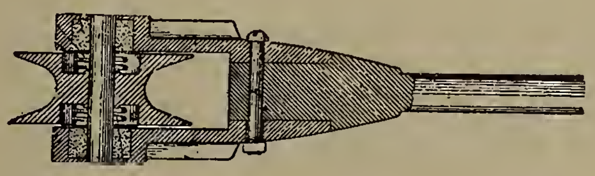
497,800. Thermostat. Emil C. C. Krogh, Monmouth, Ill., assignor of one-half to S. D. McGovern and Thos. B. McGovern, same place. Filed Jan. 11, 1893.

497,822. Electro-Therapeutic Appliance. Henry C. Royer, Los Angeles, Cal., assignor of one half to John E. Reed, same place. Filed Oct. 3, 1892.

497,832. Electric Mining-Machine. Elmer A. Sperry, Chicago, Ill., assignor, by mesne assignments, to the Thomson-Houston Electric Company, of Connecticut. Filed Oct. 8, 1888.

497,836. Safety Block System for Railway Signaling. William R. Sykes, Jr., and John P. O'Donnell, London, England. Filed Oct. 1, 1892.

497,838. Safety Appliance for Systems of Electric Distribution. Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Company of Connecticut. Filed Jan. 29, 1890.



498,046—ELECTRIC RAILWAY TROLLEY.

497,844. Electrical-Fuse-Link. Marion C. Walls, Plymouth, Ind. Filed Mar. 2, 1893.

497,849. Wall-Socket for Incandescent Lamps. Herbert C. Wirt, Boston, Mass., assignor to the General Electric Company, same place. Filed Mar. 7, 1892.

497,852. Insulation for Underground Wires. Parvin Wright, Denver, Colo. Filed Jan. 27, 1890. Renewed Aug. 18, 1892.

497,869. Electric Accumulator. Paul J. R. Dujardin, Paris, France. Filed Mar. 15, 1892. Patented in France Mar. 15, 1886, No. 174,761 ; in Belgium Nov. 29, 1886, No. 75,423; in Austria-Hungary Dec. 10, 1886, No. 20,066 and No. 45,048 ; in England Dec.

THE
"CLARK" WIRE.

TRADE MARK.
"CLARK" WIRE.

Insulation Guaranteed wherever used, Aerial, Underground or Submarine.

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HERBERT H. EUSTIS, President and Electrician.

PATENTS—Continued.

14, 1886, No. 16,408; in Italy Dec. 24, 1886, No. 311, and in Spain Jan. 29, 1887, No. 6,554.

497,888. Electric Motor or Generator. James F. McLaughlin, Philadelphia, Pa. Filed July 27, 1892.

497,898. Electrode-Shield for Arc Lamps. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Nov. 3, 1890.

497,907. Coin-Controlled Lock for Telephones. Pitt Cook, Washington, D. C. Filed Dec. 24 1892.

497,923. Thermostatic Instrument. Morris Martin, Malden, Mass., assignor to the United States Electric Fire Signal Company, Portland, Me. Filed Aug. 9, 1892.

497,942. District-Telegraph Return-Signal Key. John M. Bell, Tacoma, Wash. Filed Oct. 24, 1892.

497,955. Temporary Circuit-Connector for Incandescent Electric Lamps. Gustav A. Frei, Springfield, Mass. Filed Dec. 19, 1892.

497,956. Incandescent Lamp. Gustav A. Frei, Springfield, Mass. Filed Dec. 19, 1892.

497,957. Incandescent Electric Lamp. Gustav A. Frei, Springfield, Mass. Filed Feb. 7, 1893.

497,963. Combined Nut-Lock and Electrical Connection for Railroad-Rails. Albert L. Johnson, Cleveland, Ohio. Filed Apr. 27, 1892.

498,021. Electric-Current Time-Meter. Henry H. Pattee, Monmouth, Ill. Filed Sept. 6, 1890.

498,022. Electric-Current Time-Meter. Henry H. Pattee, Monmouth, Ill. Filed Sept. 6, 1890.

498,046. Electric-Railway Trolley. Edward H. Allen, Cramer Hill, N. J., assignor of two-thirds to William A. Barrett, Jr., Philadelphia, Pa. Filed Nov. 16, 1892.

498,135. Conduit Electric Railway. George F. Moffett, Portland, Ore. Filed Oct. 7, 1892.

498,141. Electrode for Arc Lamps. Albert C. Seibold, Mount Vernon, N. Y. Filed Feb. 28, 1893.

498,189. Electric-Railway Conduit. Joseph L. Reynolds, Winterset, Iowa. Filed July 23, 1892.

REISSUE.

11,341. Incandescent-Electric-Lamp Socket. Isaac Goldkind, New York, N. Y., assignor to Louis Stirn and Julius Somborn, same place. Filed Nov. 22, 1892. Original No. 479,359, dated July 19, 1892.

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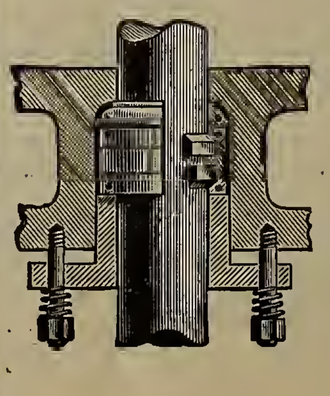

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ELECTRICAL AGE

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Current on a Lark.—The current from a trolley wire in Brooklyn got on a rampage one day last week and made things lively in the neighborhood for a short time. In a round-about way a tin roof was charged by the current, which, in its effort to find a path to the ground melted a water pipe and produced some rather pyrotechnic effects. Beyond slight damage by the escaping water no harm was done, though the unusual manifestations created some excitement in the vicinity.

ENTERPRISE IN CABLE SERVICE.

The business community of this country appreciates enterprise of real merit, and it encourages anything of that nature, particularly if any benefit is to be derived thereby. The Commercial Cable Company, through its advanced methods and departures from the old lines of conducting cable business at once jumped into popularity, and has by its excellent and liberal service kept a good hold upon the favor of business men. It proved that success always follows a well-directed effort in the direction of improvement in cable service as well as in any other line of business, and it is noteworthy that in this case the success was due to American enterprise. We give three illustrations in this issue, showing the stations of this company on both sides of the Atlantic, also the company's exhibition booth at the World's Fair, Chicago. Everything modern is adopted by this company if in any way the handling of its vast business will be facilitated thereby, and that it believes thoroughly in this policy is evident from a mere glance at the pictures of its buildings, which are modern structures. The company's employés are well cared for, the management recognizing the fact that it pays well to do this.

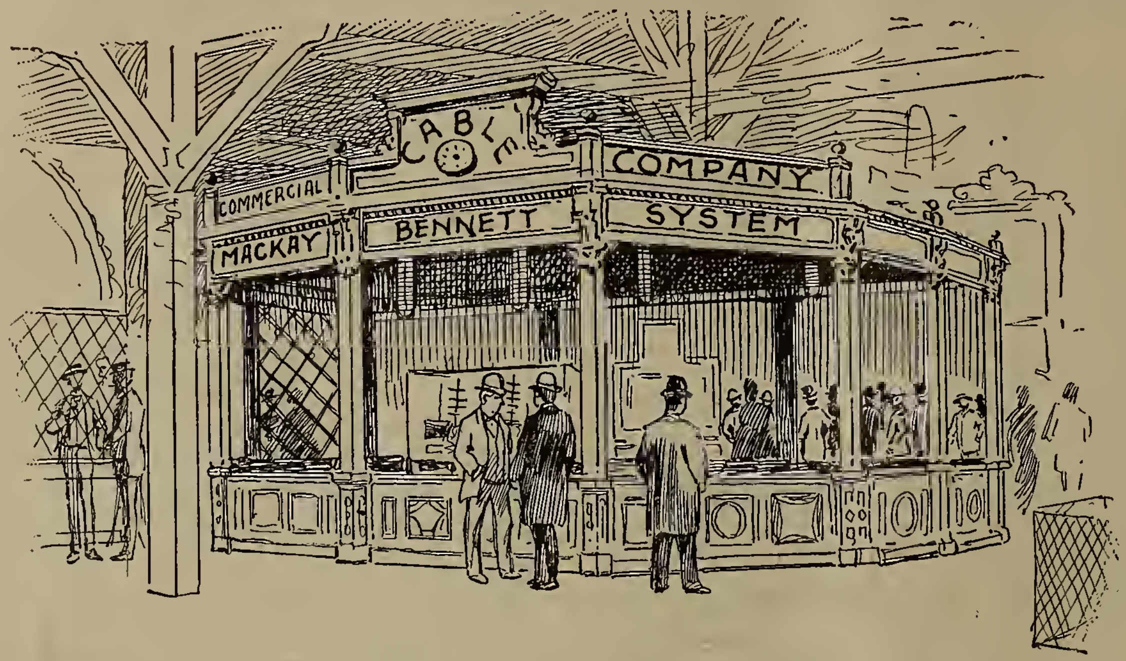
NEW METHOD OF ELECTRIC HEATING.

An interesting report comes from the United States Consul at Frankfort, Germany, regarding the recent discovery of producing heat by electricity. The discovery was made by Messrs. Lagrange and Hoho, two Belgian scientists, and if the facts as given in the report are correct, a new field for the application of the electric current will be opened. The method as described, is so simple that it seems a wonder that no one thought of it before. The thought that a bar of iron immersed in acidulated water may be brought up to the melting point by passing a large current through it while so immersed is certainly fascinating. The cell containing the acidulated water is lined with lead, the lead lining being connected with the positive pole of the source of current. A pair of iron tongs which hold the metal to be operated on are connected with the negative pole, and when the mass of iron is immersed, the circuit is completed through the liquid. The phenomena which then occur are clearly described, the result being that the iron is raised to a white heat in a very short space of time. The metal is then in a proper condition for easy welding. The report of these interesting experiments is given in full elsewhere in this issue, and although the method has been patented in Germany, investigators in this country need not be deterred from experimenting with a view to ascertaining the extent of its practical application and value. On the face of it there seems to be a wide field of usefulness for the invention.

Visitors at the World's Fair will be given an opportunity to talk by telephone with New York and Boston during several hours each day.

THE COMMERCIAL CABLE CO. AT THE WORLD'S FAIR.

One of the most interesting exhibits at the World's Fair is that of the Commercial Cable Company.



BOOTH OF COMMERCIAL CABLE COMPANY AT WORLD'S FAIR.

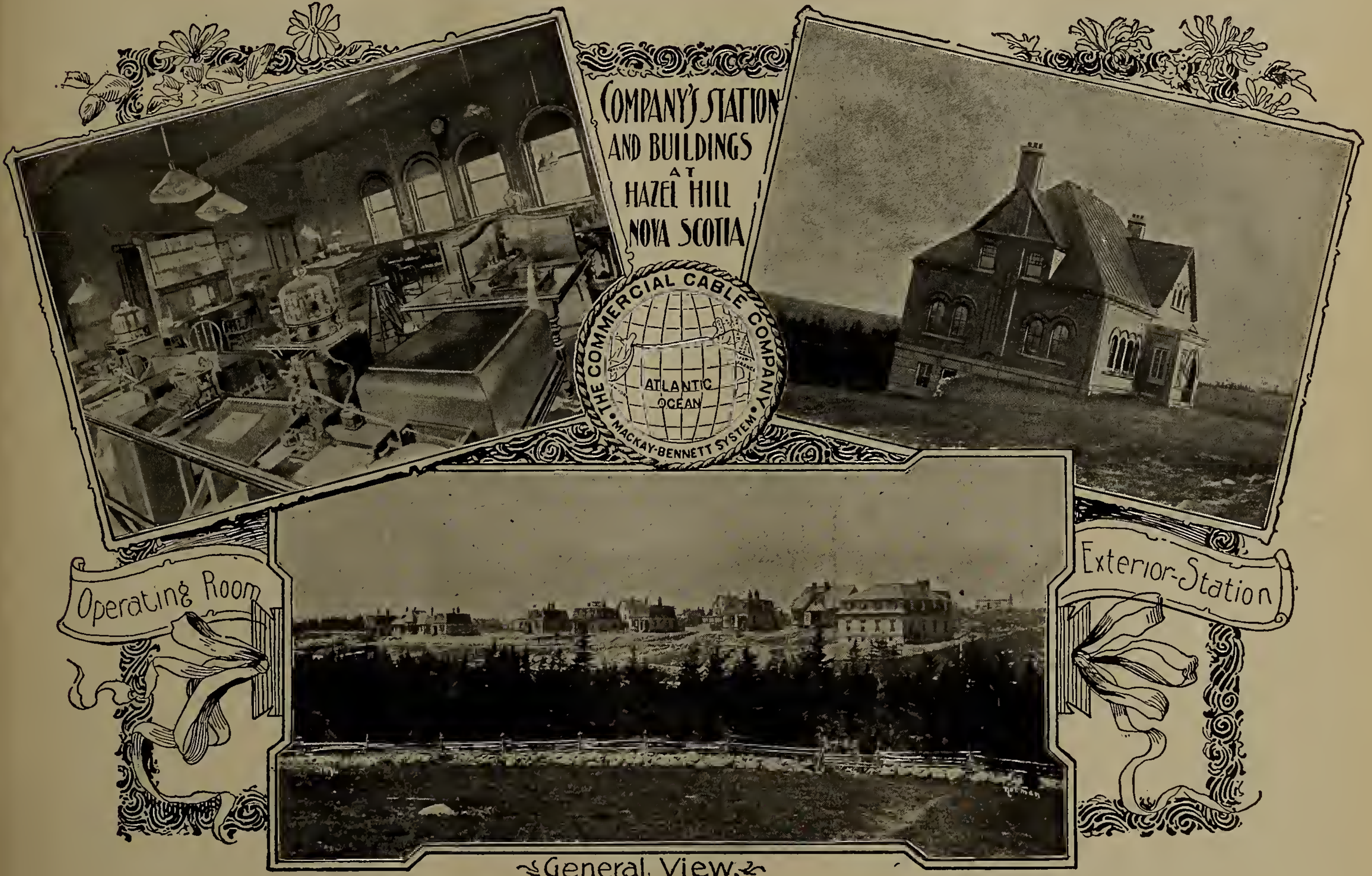
THE COMMERCIAL CABLE COMPANY
ATLANTIC OCEAN
MACKAY-BENNETT SYSTEM
Patented Dec. 20. 1887.
General View of Company's Station, Waterville Ireland
Office and Buildings

COMMERCIAL CABLE COMPANY'S STATION AT WATERVILLE, IRELAND.

There was a time, and not many years since, when submarine cable telegraphy was regarded as a mystic art. The mind was filled with spots of light, thimble batteries, delicate instruments and many other notions of a more or less mysterious and undefinable nature, and the cable operator was looked upon as a sort of supernatural being. The idea that he could communicate with his fellow operators at the opposite end of a cable two or three thousand miles in length, by the manipulation of the delicate apparatus referred to was more than the ordinary mind could grasp. But the Commercial Cable Company, with its characteristic enterprise, has upset all this. Besides giving the business community the best of cable service, it has also dispelled the mystery surrounding the service, and revealed to interested eyes the things that were once regarded as incomprehensible. In other words it does business, and any one may see how it is done.

The Commercial Cable Company came into existence in 1884. John W. Mackay, the well-known California millionaire, and James Gordon Bennett, the proprietor of the New York *Herald* being its promoters. Cheaper, quicker and improved service were the objects of the company, and how well it has accomplished these objects is now well-known to the business community. By its proverbial enterprise the company has won great favor among business men, and it is with considerable pride that it takes the stand of being at the head of cable companies in everything that concerns the business man most.

The exhibit at the World's Fair is enclosed in a booth which, in itself, is a work of art, as may be seen by the accompanying illustration. The booth is located on the west gallery of the Electricity Building. Here are shown a working exhibit of the method of operating the Commercial Cable Company's cables. The instruments were constructed especially for this exhibit, and are of the most modern and approved type. The Wilmot automatic transmitter, which comprises part of the exhibit, is an interesting piece of apparatus. Mr. T. J. Wilmot, the company's electrician at Waterville, Ireland, was the first person to successfully introduce automatic transmission on long submarine cables. Another transmitter is the invention of Mr. Charles Cuttriss, the company's electrician at New York. It is a great improvement on other like devices and greatly simplifies the process of automatic transmission. The Cuttriss transmitter has been in practical operation for five months or more and has given perfect satisfaction.



COMMERCIAL CABLE COMPANY'S STATION ON AMERICAN SIDE.

In the centre of the pavilion is a very handsome model of the company's repair ship, "Mackay-Bennett." All the cable machinery on deck is an exact reproduction of the actual apparatus, and it illustrates the manner of picking up and laying cables.

In the exhibit are also various "faults" cut out of cables showing the nature of the troubles to which submarine cables are heir to. One of these pieces looks almost like anything else but a piece of cable. It was smashed all out of shape by an ice floe, and the cable was almost severed. Sections of the latest form of cable are also shown. This cable is intended for the shallower waters and is designed to resist any rough usage. It is covered with short sections of heavy steel tubing, so joined as to admit of some flexibility.

The booth is lighted by three low-tension arc lamps of handsome design, made by the General Incandescent Arc Light Company, of New York city. These lamps, in connection with the booth and general surroundings, make a very beautiful appearance.

The Commercial Cable Company's system comprises, at present, two main cables, running from Cape Conso, Nova Scotia, to Waterville, on the southeast coast of Ireland. From Waterville, a two-core cable is laid to a point near Bristol, England, reaching London by aerial lines 150 miles long. Many of the English cities are connected with the London office by aerial lines.

On the American side a double-core cable runs from Conso to Rockport, Mass., and an aerial line thence to Boston and New York completes the connections. A cable is also run direct from Conso to the main office of the Company, No. 1 Broad street, New York city. This cable always insures a permanent connection with Europe. Views of the company's stations at Waterville and Conso are given herewith. The buildings at each station comprise a settlement of fair dimensions, and the company does everything possible to make life and its surroundings as pleasant as possible for its employés. The view of the operating room at the American end of the long cable shows the room to be a large one and has every appearance of being a very busy place.

CURVES.

BY F. H. DOANE.

The use of curves, for expressing graphically variable mathematical quantities, is not new, but their application to the different branches of engineering and to statistical work is of a much more recent date. Both Deprez and Hopkinson were early users and developers of this graphical method as applied to electrical engineering, and since that time it has come into general favor with all engineers.

Curves are used to express the relation between sets of varying values. To express their relation by a mathematical formula would often result in a very complex and nearly useless form. To the practical man, unversed in mathematics, the curve forms a line picture which shows at a glance the relation existing between the variables.

The curves are usually constructed on cross section paper. This is paper divided into small squares by two sets of ruled lines. Two of the lines are taken as base-lines. These are at right angles with each other; one vertical, the other horizontal. Two sets of values are taken and plotted, one on each of the base-lines, by giving to each division of the line a certain value. If, for instance, one wished to plot a dollar, each little division might be assumed to represent one cent, and a line 100 divisions long one dollar.

Curves can be used for expressing the relation between sets of values for all kinds of data, and it is proposed in this article to touch upon some of the most general uses of curves and give illustrations of each.

The graphic method in making financial reports is coming into use among large companies; curves showing the relation between selling price and cost; amount of stock manufactured to number of people employed; per cent. of discount on the various articles carried in stock; special discount to firms, and many other instructive and useful facts of great importance to the business man in his daily work. A curve which seems to be of great utility and which, as far as we know, has never been used, is that of the relation between discounts and articles sold. Let us take, for example, an electrical supply house:

A business of this kind carries a great variety of articles in stock. The different lines of goods often have their special discounts. Individual articles also have their discounts. Let us place all articles having the same discounts in groups, and proceed to construct our discount curve. On the vertical line lay off the discounts in per cents. letting each division represent 5 per cent. On the horizontal line at each division, mark the name of one article or of a group of articles, each article in the group having the same discount. Arrange name of goods alphabetically if possible, articles having as their first letter the letter A, being placed near the intersection of the base lines. Say 30 per cent. discount is given on ammeters; find the intersection of the vertical line through ammeters with the horizontal line through 30 per cent. Mark the spot. Let sockets and small switches have a discount of 10 per cent. Find as before, intersection of vertical line through sockets and small switches, with horizontal line through 10 per cent. Mark this point. In the same manner determine the other points of intersection. Then connect those marked points, one to another, by straight lines or a curve. We now have on a small piece of paper a figure by which one can tell at a glance what otherwise would take some time to look up in a book. As discounts change occasionally, corrections may be made by bringing a dotted vertical line up from the article, till it intersects the horizontal line through the new discount. A sample curve is shown in Fig. 1. A figure of this kind would be well to have placed near the business desk, or in a compact form for a salesman's use. It gives as much information as several pages of tables. If special firms in the trade have special discounts, a curve could easily be made, illustrating such discounts by plotting the names of the firms as abscisses (on horizontal line) and discounts as ordinates (on vertical line).

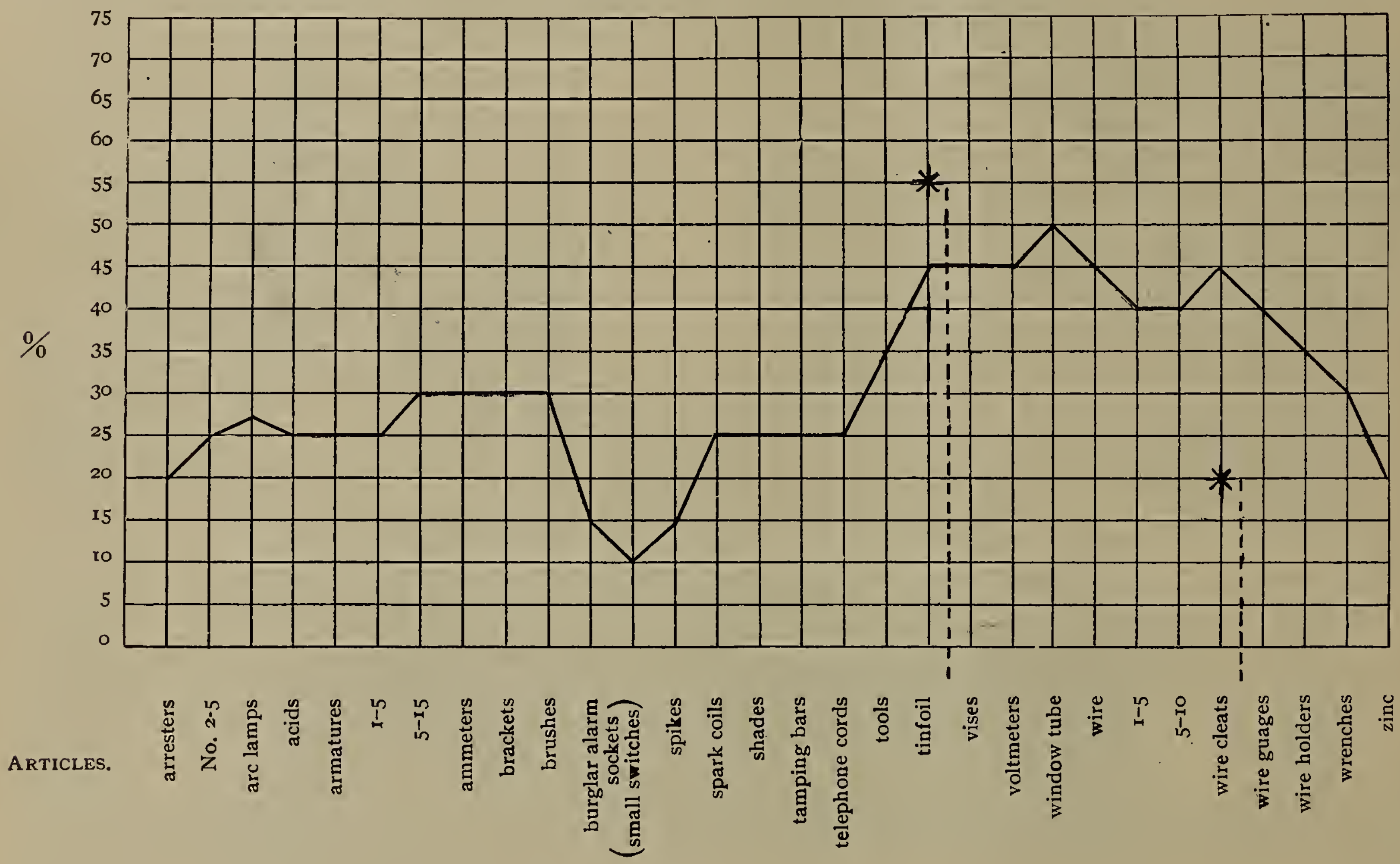


FIG. 1.

With a little thought many uses for these curves to the business man suggest themselves. In making reports on statistics much space is saved by using curves instead of tables. For instance, it is desired to show the population in four cities ; A. B. C and D, during ten years. Lay off the years as abcisses and the population as ordinates. From the data, lay out the curves, making a distinction between the curves of the different cities by constructing them of solid lines, broken lines, etc. Fig. 2 illustrates these curves.

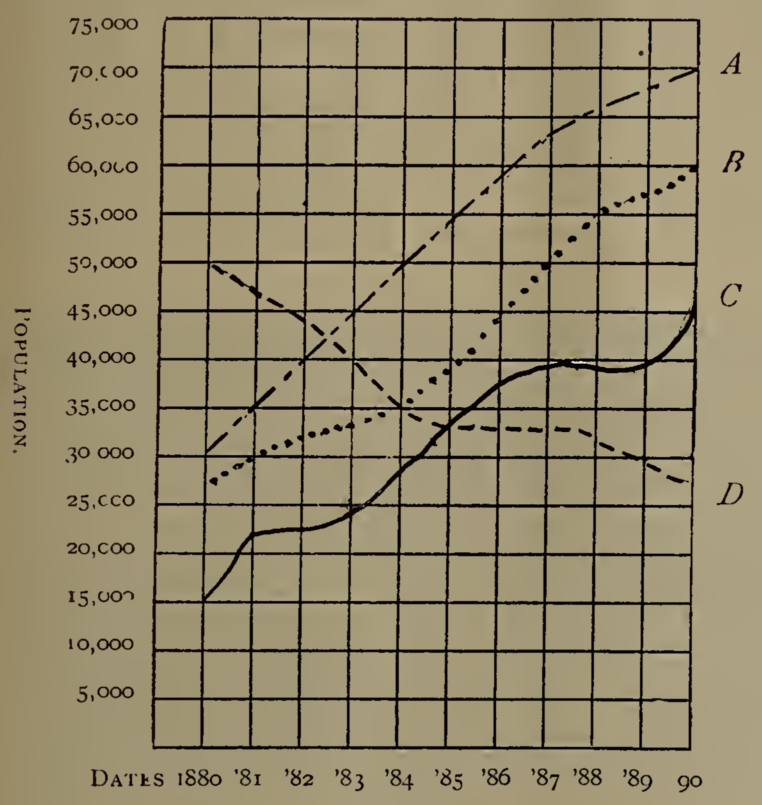


FIG. 2.

In mechanical engineering, curves are used in place of tensile strength tables, etc. For an example let us take a round bar of metal and see how the breaking strength varies in regard to the diameter. Use the tensile strength as abcisses and the diameters as ordinates. From the tables a curve may then be constructed showing clearly the relation between the sets of values. Fig. 3 illustrates curves for two kinds of metals.

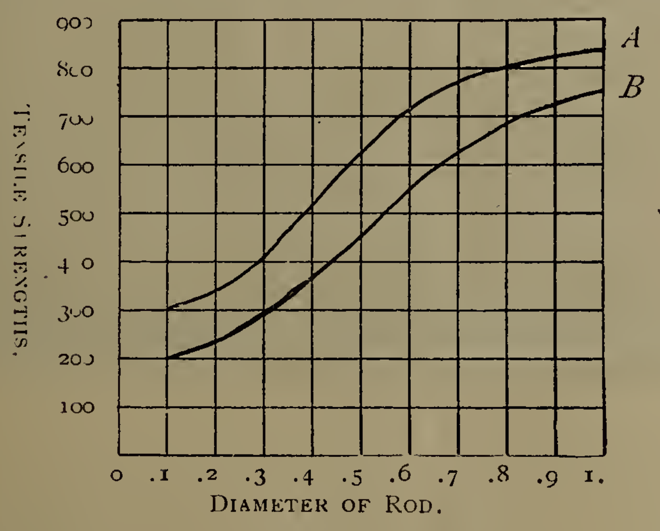


FIG. 3.

The object of this article being to call attention to some of the varied uses to which this method is and can be applied, the detail is left to the ingenuity of the person using it. Curves may be constructed having as base lines a straight line normal to a curve. Fig. 4 is an illustration of this. Here is a curve of the potential at each bar of a commutator. A circle representing a commutator is taken. Its perimeter is divided into 360° which are laid off as the abcisses. At each divison a normal to the curve is drawn. The voltages are laid off on these as ordinates. Construct the curve by drawing a line through the points of intersection of the normals through the abcisses, with the circles through the ordinates. In Fig 5 the development of the curve in Fig. 4 is shown. The gradual rise and fall of the potential is here well illustrated.

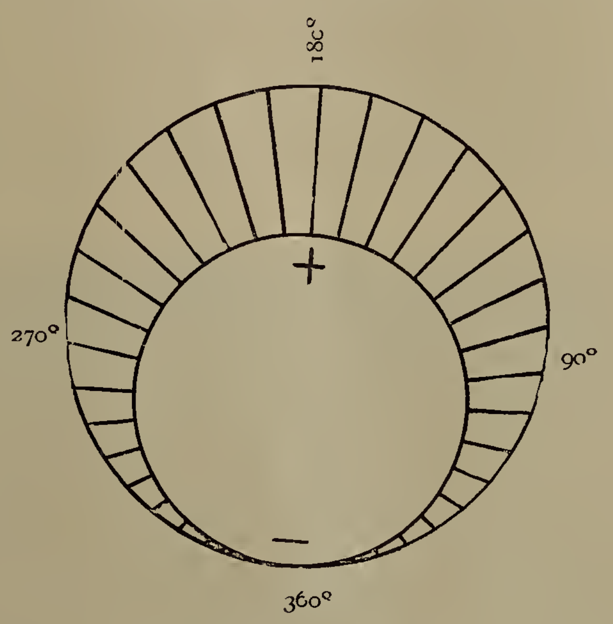


FIG. 4.

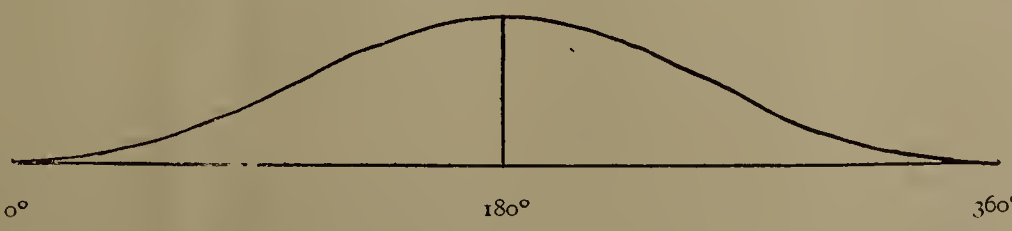


FIG. 5.

Many manufacturers of motors make extensive claims as to the merits of their apparatus. If the machine is an efficient one, why would it not be well, say in the case of a railway motor, to publish in their advertisements a characteristic made up of efficiencies and speed in miles per hour of car. Such a curve is shown in Fig. 6, which was constructed from experimental data on a railway motor.

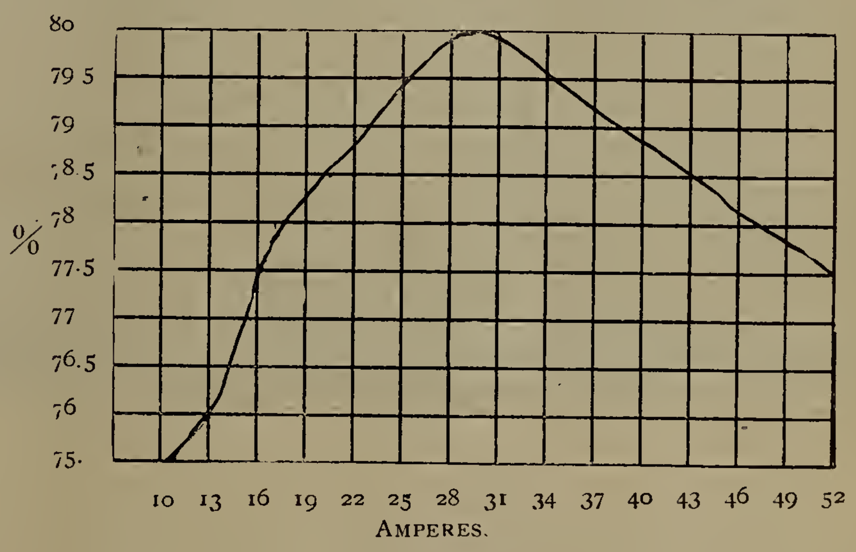
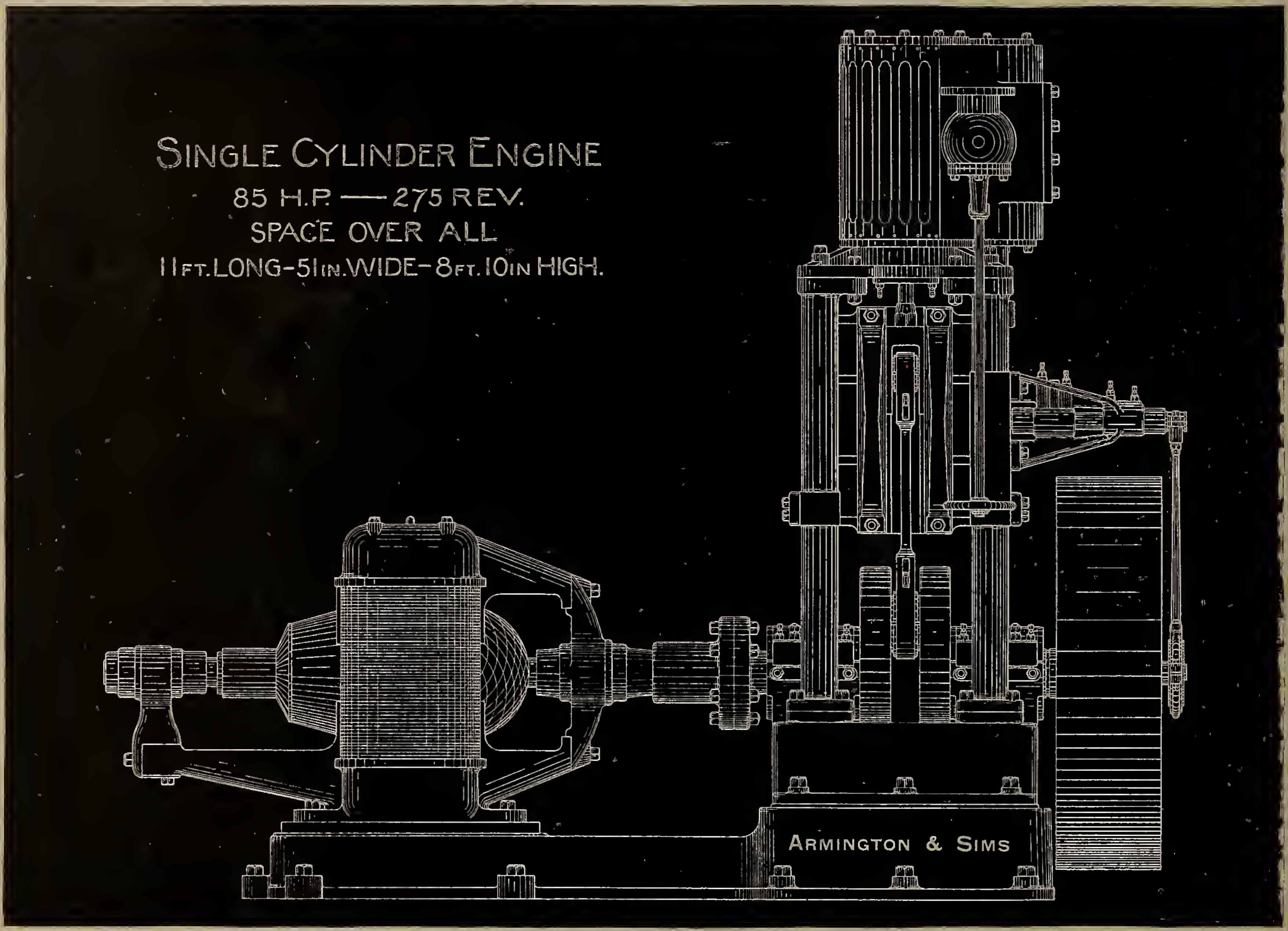


FIG 6.

A COMPACT LIGHT PLANT.

An electric light plant which is in many respects a wide departure from the usual practice is that now being installed in the new Vanderbilt Building on Beekman street, New York city. It is conspicuous for its remarkable economy of space, and those who designed it probably have good grounds for the claim that it would be difficult to find another plant of the same capacity occupying so little space.

Another notable feature of the plant is the slow speed of the dynamo—250 revolutions a minute. This means, of course, less wear and tear, and consequently low expense.



ELECTRIC LIGHT PLANT IN THE VANDERBILT BUILDING, NEW YORK CITY.

The engine and dynamo are built on a common bed plate, 11 feet long and 4 feet, 3 inches wide. The engine is of the vertical type, made by the Armington & Sims Engine Co., Providence, R. I., and was furnished by E. P. Hampson & Co., of New York city. It has a rated power of 85 H. P. and the size of its cylinder is 12x12 inches. The engine's shaft is coupled directly to the armature shaft of the dynamo, the latter machine being of the Westinghouse incandescent type. The plant now consists of two of these combination engine and dynamo sets, both being alike, but extensions provide for two more, making four in all. The dynamos, made by the Westinghouse Electrical and Manufacturing Company, are of the bi-polar class. Their capacity is 650 lights each at 110 volts and from the fact that they run at slow speed the difficulties in operation at high speed are absent here to a marked degree.

The two independent units will supply 1,300 lights, but when the plant is completed the number of lights will not be much short of 3,000.

The engine stands ten feet high on its bed, and has every appearance of being substantially built, which is characteristic of all the Armington & Sims machines. The dynamos too are compactly built, and the finish and efficiency of the machines reflect great credit upon the resources of the Westinghouse Company.

The wiring of this plant is of the simplest character. It is all in moldings, none being concealed or inaccessible. The wires in the various sections, from the dynamos to the lamp circuits, are larger than are usually provided, the object being to keep the heat down. The switchboard is also extremely simple, and stands on two pairs of iron legs like a blackboard. It stands well into the room, allowing free access to the rear. It is made of white plain marble.

Mr. Chas. L. Eidlitz, of 10 West Twenty-third street, did the wiring and supplied the switches.

Indianapolis' Model Street Railway System—The franchise granted by the City of Indianapolis, Ind., to the new street railway company gives the city, it is said, better terms for the use of its streets, than are obtained by any other city in the United States from street railroad companies. If the company maintains its position, Indianapolis will present a model in street railway management.

ELECTRO-MECHANICAL GONG AND GAS LIGHTING CABINET.

A large number of special devices are used in household electric, as well as bell work and the Western Electric Company, Chicago, Ill., carries a great variety of specialties along these lines. The ingenuity shown in the design of the instruments and their artistic finish makes the apparatus ornamental as well as useful.

Fig. 1 illustrates an electro-mechanical gong. This device is of great service in machine shops, boiler shops or in any noisy place where the ordinary vibrating bell would not be heard. They are also used for fire alarms and signals near railroad crossings. They are well made and reliable.

A gas lighting cabinet with switch, spark coil and battery is illustrated by Fig. 2. This apparatus is designed for public buildings, halls, etc., and is encased in a finely finished black walnut box. It consists of an induction coil with key and circuit breaker, a double bichromate battery and a circuit switch. By the use of the hand key the attendant has complete control of the time for applying the spark. The battery is durable and inexpensive to maintain, and the elements can be lowered or raised as desired. The burner consists of a lava standard and tip, with platinum pointed electrodes over the tip. The box may be placed in any convenient spot as it makes a handsome addition to the other furnishings.

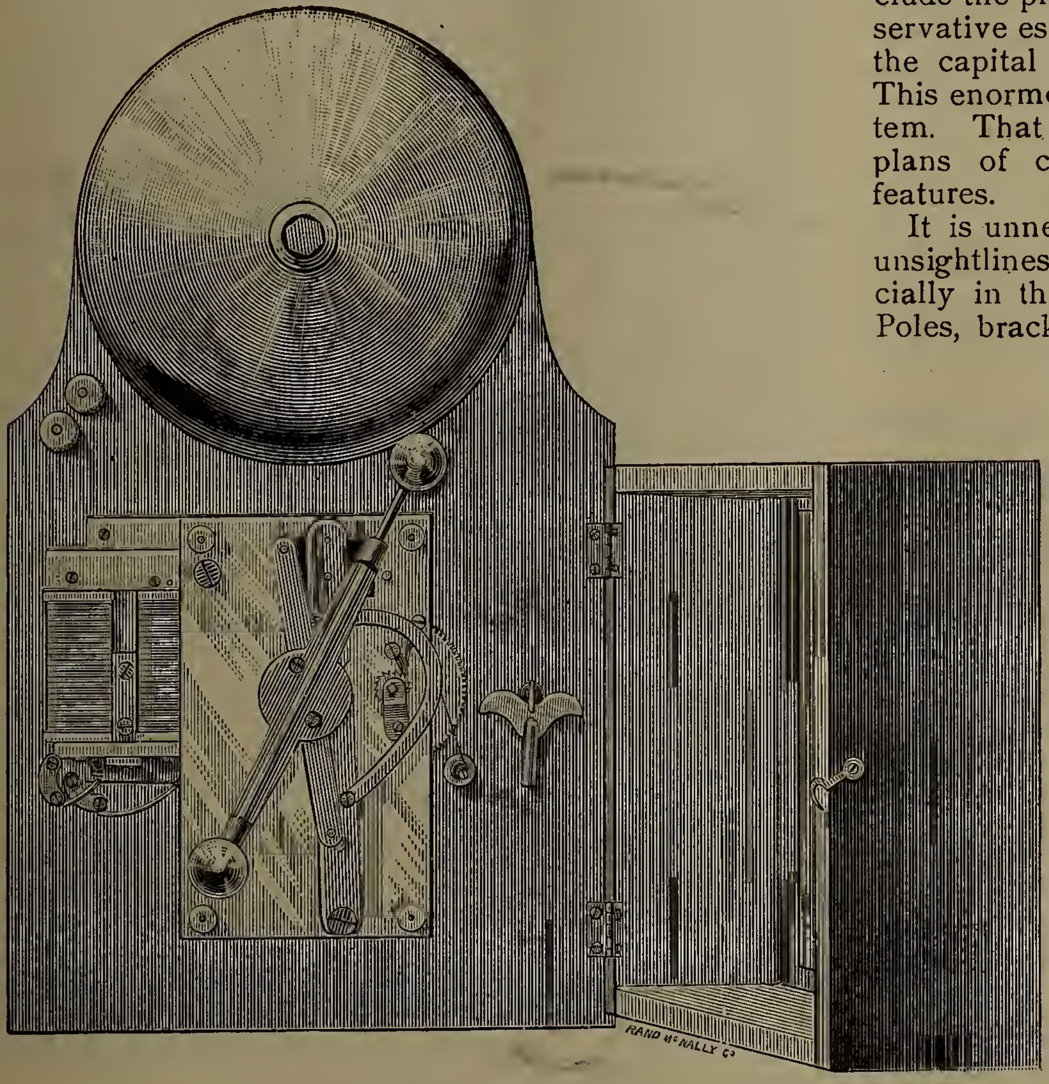


FIG. 1—ELECTRO-MECHANICAL GONG.

The Winston-Salem Railway and Electric Company, Winston, N. C., has as president J. H. McClement; T. M. R. Meicklehan, manager, and a capital stock of $300,000. The road is seven miles long and has nine motor cars, one freight motor car and three freight trailers. One day last year, this road carried 9,773 passengers, the Barnum circus being in town at that time. This road is building up the business of the vicinity.

THE WHELESS ELECTRIC RAILWAY CO.'S CONDUIT AND AERIAL TROLLEY SYSTEM.

If the demands for a good underground electric conduit system for street railways are as great as the innumerable novel inventions in that line now patented and pending in our patent office, it appears to all of us that it cannot be without its reasons.

Under the present methods of construction the street railway enterprise in this country has already reached formidable proportions. Electric traction, though practical demonstrations of its workings on a commercial basis takes us back only a little over a decade, is fast gaining the lead in popularity. In that short period of time, in this country alone, the railway reports of last October record 5,446 miles of trackage, representing an investment of $205,870,000 which figure does not include the premiums on stocks and bonds which a conservative estimate would put at $45,000,000, bringing the capital invested to an aggregate of $250,870,000. This enormous total is invested in the aerial trolley system. That system, even built on the most approved plans of construction, has its many objectionable features.

It is unnecessary to cite the inconveniences and the unsightliness of a bare overhead conductor, more especially in the thickly populated districts of our cities. Poles, brackets, span wires, guard, feeder and other wires all present a most unsightly appearance in our streets, to say nothing of the obstructions offered to the manœuvring of our fire department service and of the limit fixed to the height of vehicles that shall be drawn along our public thoroughfares.

With these disadvantages on the one hand, the utility and conveniences offered our public on the other, the aerial trolley system is today taking a lead in the enterprising world. The long-suffering public who for years relied upon the horse cars do gladly put up with the disadvantageous features of the trolley as more than a compensation for the convenience it offers. The trolley has come to stay. With the cry of today—"bury the wires"—the trolley in our crowded cities must follow the innovation.

The conduit trolley system offers a solution of a perfected system free from the grave disadvantage of danger, unsightliness and obstruction.

Storage battery traction has so far not proven a boom to its investors. Whether it is because a few of our contemporaries in the legal profession have acquired all the spoils which to date have unfortunately been the necessary initial expenditures preparatory to perfecting that system, and we have promised us in the near future a commercial success, is yet to be seen.

The alternating current has promised us for years a solution of the problem of eliminating danger by very low pressure exposed currents. It has also in theory many novel means of doing away with the unsightliness. But first we must have the alternating current motor.

Our attention is drawn to the operation of the Siemens Halske Underground Conduit System which is installed and in operation at Buda-Pesth. This has proven a commercial success. The operating expenses of this road are reported to be considerably under 50 per cent. of its gross receipts. In further evidence of the satisfaction this system has given, it is reported that several miles of extensions are to be added this year. The conduit of this Buda-Pesth line is a structure built of iron to the inside walls or sides of which the working conductors are attached with insulators. The conductors are a continuous and unbrohen metallic circuit which throughout the entire length of line are continuously charged with current. Unquestionably the problem dealt with is insulation. If there is a steady leakage of current on the line above described, it must not impair the efficiency of the entire system as compared with other modes of power transmission or must too serious a break be the result of an occasional accident.

To take a broad view of the subject of insulation of the conductors in the underground conduit system, we have the promise that the larger the conduit the less the danger of breakage. But the larger the conduit-way the greater the cost. The problem we have always to deal with is minimum expense, which means minimum size conduit to operate at minimum loss of power. Any railway engineer can design a conduit system that will work with no greater difficulties than the aerial system provided there be no limitation made to cost. To exaggerate this idea: An arched tunnel with the track built on top and brackets for the conductors from the inside walls would almost entirely eliminate the tendency of leakage.

The multiple arc is the only practicable system of wiring for the distribution of electric power for street car motors. In an underground conduit the tendency to leakage is therefore over the entire length of active bare conductor. The tendency of short circuit is always present and the leakage varies with the dampness and other conditions of the surroundings.

It is in this direction that the Wheless system differs from all other systems, barring, of course, mechanical contact systems, where the continuous abrasions of contact are hazardous.

In the Wheless system the current is carried in an insulated cable buried between the rails, if a double track road, or by the side of the rails, if a single track road. This feeder cable extends the entire length of the line and from it the current is automatically switched into the trolley wire in the conduit as the car passes along. The trolley wire is not a continuous wire but is broken into insulated sections of convenient lengths. The rails form the return circuit as in the aerial trolley system.

Electro-magnets, or relays, situated in the manholes of the feeder systems connect the feeder and the trolley conductors. They are spaced at intervals of two or three hundred feet apart, averaging between seventeen and twenty-five per mile.

The relays are actuated by an auxiliary current carried on each car. As soon as the contact is made between feeder and trolley through the relay, the current required by the motor maintains the contact and the circuit.

The auxiliary current is obtained from two cells of storage battery, the current from which after energizing the relay is automatically cut out. The car cut-out is used to prevent draining the storage cells, as the current is used only to make momentary contact at the relay.

The Wheless Electric Railway System has been installed on a portion of the Washington and Arlington Railway, of Washington, D. C., where it has been in successful operation since March, 1893. About three-quarters of a mile of conduit has been laid. It was put in under the most disadvantageous circumstances, all work having been done in the dead of winter. As the tracks of the Washington and Arlington Railway were laid on stringers the yokes for the slot rails of the conduit were designed to fit between the stringers on the ties; thus the roadbed was not disturbed.

The yokes used, weigh about 180 lbs. and the slot rail 40 pounds. The slot is seven-eighths of an inch wide and the conduit itself sixteen inches deep by seventeen inches wide. Wooden sides, top and bottom form the conduit. The insulators are attached to brackets which are bolted to the yokes. The relays and the car cut-outs are light in weight and were made with carbon contact surfaces.

The trolley rides on the upper surfaces of the wires in the conduits and presses against the conductors by springs which take up all oscillating motion of the car body. As the line on which the cars run is partly the aerial and partly the conduit system the trolley is raised at the terminus of the underground section. This is a very simple operation. It is done by means of a lever on the car, requiring no handling from the outside. The only care to be taken is that the trolley is over the pit.

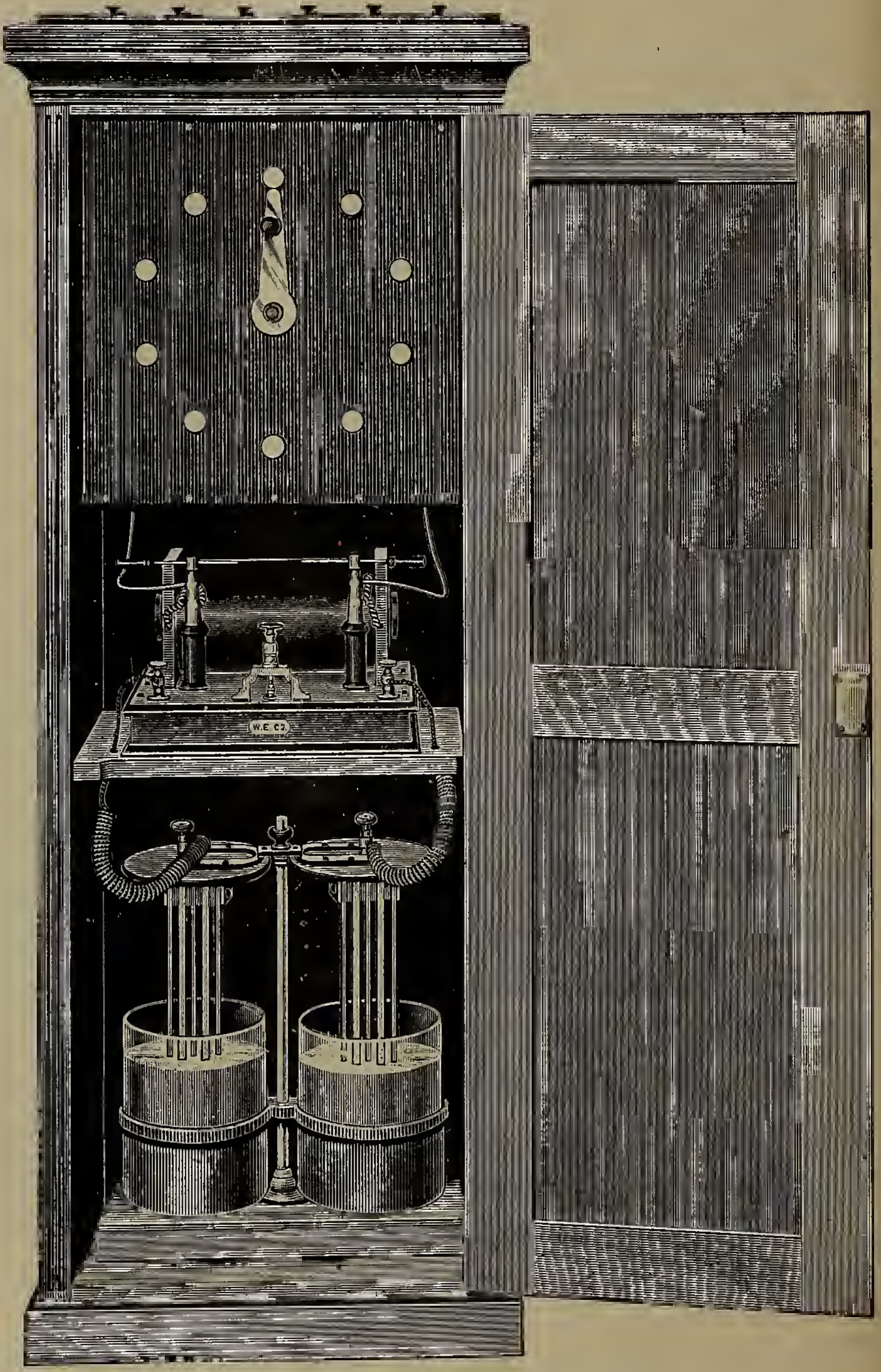


FIG. 2—GAS LIGHTING CABINET.

Although the portion of the line near Washington, built under the Wheless Electric Railway Co.'s patents, is but a temporary structure, the operation of the cars from the beginning gave most satisfactory and encouraging results. Tests failed to show any appreciable leakage of current. The conduit is drained only in about four places. There are several grades, the maximum being nearly seven per cent. Four curves are on the line, two of 48 feet radius; there is also on the route a turnout and one siding.

The work was installed under the direction of Messrs. Pepper & Register, Electric Railway Contractors and Engineers, of Philadelphia.

As soon as the bridge of the Washington & Arlington Railway is built across the Potomac, the conduit system will be constructed on the city portion of the line from

Georgetown to the Pennsylvania R. R. depot, 6th and B streets.

The aerial system controlled by the patents of the Wheless Electric Railway Co., offers a key to the solution of eliminating the dangers of the aerial trolley wire. No description of this will be necessary as it is but the conduit trolley system, already described, with the trolley put overhead. The relays may be placed in neat iron boxes on the poles, or if the feeder conductors of the road are carried in conduits they may be placed in the manholes as in the underground system.

It might be well to state here that the relay which at first glance one might think a delicate mechanism is not so by any means. On the Washington and Arlington Railway there have been no difficulties experienced. In fact, the iron covers have only been raised from one since the road started, and that was merely for the purpose of inspection. The tendency to arcing of the current in the relay, as the current is cut off from the section, is nil, as the contact surfaces are separated only by the absence of current in the relay.

The Wheless Electric Railway Company has appointed Messrs. Pepper & Register the sole contractors for the systems in the United States. Plans and details for most approved installations have been made and they are prepared to give accurate estimates of costs, and to contract for the installations of the system on any street railway lines.

A full inspection is invited to the line in Washington now in daily operation.

REVOLUTION IN ELECTRIC HEATING.

The above is the title of an interesting report made to the State Department, Washington, by Consul-General Frank H. Mason, at Frankfort, Germany. As the subject presents some entirely new features in the development of heat by electricity, and as it opens up a new field for the application of the system, we deem it of sufficient importance to publish the report in full. It is as follows :

" A discovery so original and so wide in its practical application that it is believed to open a new and important chapter in the use of electricity for heating purposes has recently been announced from Brussels and tested at Berlin. The invention is the joint achievement of two Belgian scientists—Messrs. Lagrange and Hoho—who a few days ago applied to the imperial German patent office for patents on a new method of heating, melting and refining metals by means of electrical heat. The means, as designated in their claim, were so simple and the results as therein described so incredible that the patent-examiners demanded that before issuing the patent a practical demonstration of the process should be made in their presence. The matter was referred to an eminent and disinterested electrical expert at Berlin, who made the first essays in his private laboratory and was so delighted with the result that he asked by telegraph permission of the inventors to repeat the demonstrations before the Electro-Technical Society at the German capital. Permission was readily granted, and the experiments were performed before a group of expert electricians with brilliant success. From the account given by one of the experts who was present at these demonstrations and from various other sources the following report of the new process has been derived.

The apparatus consists of a glass or porcelain vase, which may be of any size conveniently adapted to the purpose, provided with a lining of lead connected with a strong conductor of positive electricity. The vase is filled to three-fourths its capacity with acidified water. A pair of iron tongs with insulated handles is attached by a flexible conductor to the negative pole of an electrical current generated by an ordinary dynamo. With this simple and inexpensive equipment the following phenomenon is produced.

The electrical current having been switched on, a bar of wrought iron or other metal is taken up with the tongs and plunged into the water within the vase. Immediately the water begins to boil at the point of contact; the immersed portion of the iron rises quickly to a red, then to a white heat, and emits a stream of brilliant white light. In a few moments the heat becomes so intense that the iron melts and falls off in bubbles and sparks, leaving a clear, glowing surface in perfect condition for welding. The heating process has been so rapid that neither the water nor the end of the bar held within the tongs have been more than slightly warmed, and, the current being switched off, the bar, with its submerged end glowing, may be readily held in the naked hand. If, instead of a bar of metal, a stick of carbon is used, the heat in a few minutes produces detached fragments of amorphous carbon, which proves scientifically that a temperature of 4,000° Celsius has been developed. The rapidity of the heating and the limit of temperature to be reached are easily and accurately governed by the strength of the current employed, so that the whole process is under the absolute control of the operator. During the recent experiments at Berlin the measuring instruments registered a tension of 120 volts and an energy of 220 amperes. It was estimated that fully fifty per cent. of the current was directly utilized as heat, whereas the practical limit of such utility has not hitherto exceeded 20 per cent. It is stated by the inventors that by employing a still stronger current a temperature of 8,000° Celsius has been developed. The mechanical importance of this fact will be apparent when it is remembered that this is a degree of heat nearly three times greater than that required to extract iron from the ores, the most refractory of which fuse at about 2,700.°

Divested of all merely technical phraseology and reduced to its simplest terms, the process under consideration may be explained as follows : One of the well-known effects of electricity is to separate compound fluid bodies through which it passes into their primitive elements. The current, passing through the tongs and metallic bar into the water, decomposes the latter into its two gaseous elements—oxygen and hydrogen. The oxygen is attracted and gathered on the relatively large surface of the lead lining and produces no noticeable effect. The hydrogen, on the other hand, gathers around the immersed portion of the bar ; and, as this has a comparatively limited surface area, it is immediately surrounded with a close envelope or jacket of hydrogen, which, being a bad conductor of electricity, creates a powerful resistance to the passage of the current and thus develops the heat which causes the bar to glow and melt. It is merely an application of the well-known law that friction or resistance to the passage of an electrical current causes heat, and the apparent paradox of a piece of cold metal plunged into cold water rising rapidly to a melting glow is as simply and clearly explained as the incandescence of a platinum coil in a vacuum bulb.

It is as yet too early to form any definite estimate of the practical range of this discovery or its commercial value. Thus far it has been applied experimentally only to the welding of various metals, but with such success that it promises, in that special field, to inaugurate a complete revolution. Hitherto electrical energy transformed into heat has found but few successful applications in industry. For welding purposes it has been not only two expensive for general adoption, but it has entailed certain technical defects which have proven serious and difficult to overcome. As the temperature of the electrical furnace has been heretofore difficult to govern, the iron has often been overheated to the point of partial melting. This seriously affects its quality, as on cooling the metal does not resume its original fibrous texture, but becomes crystalline, with an important loss of tensile strength. Another disadvantage has resulted from the fact that iron, when used for practical purposes, is rarely, of never entirely pure, but contains more or less carbon. Steel and wrought iron contain less carbon than cast iron, and when heated in the ordinary electrical furnace, where the heat is generated by the passage of the current between two carbon points, particles of loose carbon which have been detached by the current combine with the hot metal and convert it into something analogous to cast iron.

All these difficulties are apparently completely mastered by the newly discovered process above described. For welding purposes, it is pronounced perfect. The clean envelope of hydrogen which surrounds the heated metal prevents oxidation, and the welding surface is left free from the effects of sulphur and other impurities, which are always present when iron is heated by a coal fire in an ordinary forge. The quality which entails the largest possibilities, and which has been as yet only superficially investigated, is the capacity of this process to heat quickly and to any desired temperature the end or submerged surface of a mass of iron while the remainder of the mass is left cool and comparatively unaffected by the heat. It is believed that this may lead to important results in the hardening and tempering of armor plates and other objects in iron and soft steel in which great resistance to penetration or abrasion by friction is requisite, while preserving the interior tough and fibrous to resist concussion or strain, as in many parts of machinery. At Essen, Messrs. Krupp & Co. are experimenting with it in the hardening of steel cannon ; and it is believed that in chemistry this method of producing an intense and easily regulated temperature may lead to the successful manufacture of diamonds, rubies, and sapphires through the production of the larger forms of crystallized carbon.

Whether it is applicable as an electrolytic process to the reduction of metals seems to be disputed. One account claims that by it the cost of refining gold, platinum, copper, nickel. and even iron will be reduced 80 per cent. while other authorities assert that, though metallic oxides may be successfully reduced by this method, no other foreign substances contained in the metal will be eliminated by it. In any event, however, the discovery of the principle that has been already demonstrated must open a wide and interesting field of research to the electricians of all countries.

LONG DISTANCE TRANSMISSION.

The long distance transmission of electric power has already taken an important part in electrical industries. The Pacific coast is, in America, the most promising field for long distance work, although several installations have been made in the Eastern states, notably the Niagara Falls power plant, which is now in process of construction. In the Rocky Mountains are found numerous places where a high head of water is easily attainable and within from five to forty miles of villages and mines, where power would meet with a ready sale. As these settlements are usually in places where it is of great difficulty to obtain coal for steam power plants, the transmission of power from a distance would be of great utility for the purpose of running mining machinery, lighting and other work. That there is a great future for long distance transmission work is shown by the number of new plants which are being installed. Continuous current work cannot, under ordinary requirements, be used economically to transmit a large current for any great distance. The voltage cannot be above a certain figure without danger of its breaking down the insulation and causing damage to the machines. Fifteen hundred volts is by some electrical engineers placed as a safe limit. This fact has driven the long distance engineer to use and experiment with alternating current for this purpose. Here, by aid of step-up and step-down transformers, the voltage of the generator may be kept within safe limits, the voltage of the line very high, say 10,000, and the voltage applied to the motors at the receiving end of the line low. Three alternating systems are in use at the present time. The single phase or popularly called, synchronous system, the two phase and the three phase. The first system is used in the Telluride, Colorado, plant and is working successfully. The second and third systems are used more extensively and the motors used, in the latter at least, have been made self starting. These last two systems are designed for general electrical work. A large transmission plant will soon be installed for the transmission of 3,000-horse power to a distance of twenty miles, guaranteeing 79 per cent. efficiency from generator axle to point of distribution. The future for this system is indeed broad and it is difficult to place the limit of development.

NEW BOOKS.

Electricity and Magnetism. By S. R. Bottone; 197 pages; 102 illustrations. Whittaker & Co., London, George Bell & Sons, New York. Price 90 cents.

This work is of an elementary nature and designed as an introduction to the sciences treated. Considerable space is taken in illustrating the theory of magnetism and a good deal of attention is given to the "molecular" theory of electricity. Pith-ball and frictional machine experiments are shown and explained. The latter portion of the book treats of batteries, measuring instruments, electrolysis, electro-magnetic theory, dynamo electric machines, etc. The book is of value to the beginner as care is taken that the data is reliable, and the matter is treated in a clear and simple style.

Vade Mecum. Compiled and arranged by D. B. Dixon, with a comprehensive treatise on electricity by Thos. G. Grier. 480 pages. Chicago: Laird & Lee. Price $2.50.

In our limited space it is impossible to state the contents of this book, as it covers so vast a ground. It is not intended as an educational work, but rather a work of reference for the use of professional and business men, as well as operative mechanics. It is compiled from the most authentic, scientific and mechanical sources, and there is no department of industry or profession that is not covered by valuable facts and figures for reference. The work commends itself particularly to architects, architectural iron workers, builders, contractors, engineers, railway supply agents, superintendents, master mechanics, machinists and business men generally. It is a valuable work of reference for all of these.

World's Fair.—On the night of June 1, Electricity Building at the World's Fair was for the first time completely lighted by its 456 arc lamps and 15,000 incandescent lamps. The exhibits were also lighted up, and the display of electrical apparatus may now be said to be complete. The great pillar of light of the General Electric Company's exhibit was also lighted with impressive effect.

REPORT OF THE COMMITTEE ON THE PROVISIONAL PROGRAMME FOR THE CONGRESS.*

(The following appendix is the one referred to in the report of the Committee on the Provisional Programme for the Congress. See January and February issues.)

APPENDIX IV.—ELECTRIC NOTATION, ABBREVIATIONS AND SYMBOLS.

The following is an abstract of a paper read by Mr. E. Hospitalier at the International Congress in Frankfort, 1891, giving the system which the committee of the American Institute of Electrical Engineers suggested, using as a basis for an international system to be adopted at the next Congress.

The object of this system is to introduce a uniform international system of symbols, abbreviations, etc., for terms used in the electrical science, which shall be as universally adopted and understood as the various signs used in algebra and trigonometry, for instance. In such a system, he states, that it is indispensable to establish a clear and precise distinction between a *physical quantity*, its *magnitute* or *value*, and the *unit* for measuring such a quantity. A physical formula shows the relation between physical quantites each of which is represented by a special symbol. The magnitude or value of physical quantities are represented by the ratios of the physical quantity and one of the same nature taken as a unit; the magnitudes or values of physical quantities are therefore simply abstract numbers. A *unit* is a physical quantity of a special magnitude which serves as a measure of quantities of the same nature; these units are designated by special names, and may be represented by abbreviations for the sake of simplification. Symbols representing physical quantities enter into physical formulæ, but units never do. In the C G S system, for instance, the three basic physical quantities are length, mass and time, which are represented by the respective symbols L M and T; the corresponding units are the centimeter, the mass of one gram, and the second; their abbreviations are cm, g and s. For derived quantities, definitions are established by equations which show the relation between the fundamental quantities. The physical quantity *surface* for instance would be represented by the symbol S and defined by the equation $S = L \times L = L^2$ and the unit for measuring t is the square centimeter represented by the expression cm^2; the physical quantity *velocity* represented by v is the quotient of the length by a time and is defined by the equation $v = L \div T = L T^{1}$ and the unit is a centimeter per second. This would establish the important and essential distinction between the symbols representing physical quantities, and the units for measuring their magnitude. He suggests using italics, Greek and script letters exclusively for symbols, while the units and their abbreviations he suggests using Roman letters.

He suggests furthermore using the same letters for physical quantities of the same nature whose dimensions are different, or for different physical quantities whose dimensions are the same; he proposes, for instance, to use the symbol W for the physical quantity "energy," be it mechanical, thermic, chemical affinity or electric; also, to represent the moment of a force or of a couple, as it is, like work, the product of a force and a length. A length and a co-efficient of self-induction have the same dimensions and are to be represented by the same symbol L to which in certain cases an index may be added to avoid confusion. He furthermore suggests adopting the system already in use of representing kilometres by km, millimetres by mm, milligrams by mg, etc. Of the six different ways of representing quotients:

$$\text{centimetre per second};\ \frac{\text{centimetre}}{\text{second}};\ \frac{\text{cm}}{\text{s}};\ \text{cm : s};\ \text{cm.s}^{-1};$$

cm/s; he recommends using cm : s as the simplest. His suggestions for a complete system of such units and quantities as are used by electricians, is given in the following table which he claims to have modified to conform with the decisions adopted by the Congress of 1891, which have been given in Appendix I.

In addition, he also suggests the advisability of a uniform system of reference to articles in technical periodicals; this should state the volume, the page, the *date* and in every case the year. He also recommends that in adopting new names, very great care should be taken; the word "drehstrom" for instance, (which literally means a rotary current) does not correspond to any physical reality; the proper expression would be "polyphase alternating currents."

[The undersigned calls attention to the fact that the symbols do not all conform strictly to the adoptions of the Congress of 1891, which decided that Greek letters should be used only for physical constants and angles; Mr. Hospitalier furthermore uses "small caps" for the symbols representing the units, in place of large capitals, a modification which is to be commended, as it avoids confusing A (ampere) with A (acceleration). The chief objection which English speaking people will have to this system is the changing of the classical expression for Ohm's law from $C = \frac{E}{R}$ to $I = \frac{E}{R}$, and writing $I^2 R$ for $C^2 R$. This might be overcome by writing C for current, K for capacity, and I for moment of inertia.]

Carl Hering,
Chairman.

THE TELEPHONE PATENTS.

BY A. G. HOLCOMBE.

The late failure of the New York Legislature to regulate telephone charges can only be accounted for by the fact that the telephone financial interest permeated the investing portion of the community to such an extent that it is considered defamatory to doubt any of the rights of this gigantic monopoly. Relief can only come by opening the gates to competition.

The method patent which has been the mainstay of the Bell Company expired on the seventh day of March last. The remaining Bell patent expires on the 30th of January, 1894. This is a combination patent and has little force now that it is no longer supported by the method patent; it simply covers the combination of a diaphragm capable of inductive action with a permanent magnet. A diaphragm of wood with its centre connected to the armature of a magnet makes a much better receiver and in no way infringes the Bell patent.

In regard to the Edison patent which is supposed to cover the use of carbon in all its forms, which was recently issued, it can only be used for bulldozing purposes and probably the twenty dollars paid for this purpose was well invested. The patent was stillborn and gives the owner no standing in court.

The patent that will require the most tact and money to extinguish is the Berliner patent, issued November 17, 1891, and unless this is brought before the courts in an honest and sensible manner it will give the Bell monopoly nearly sixteen years more of life. The Bell

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* Read at the Tenth General Meeting of the American Institute of Electrical Engineers, New York, May 17, 1893.

Company will undoubtedly pursue the same course which it so successfully followed to maintain the Bell patents, namely, bring a friendly suit and place the case before the court in such a light that the judge will have no alternative but to sustain the patent and then trust to judicial courtesy to get injunctions in other courts. This Bell *vs.* Bell version is not conjecture; it was brought to light by a congressional committee, and is now a matter of record. The Berliner patent was filed June 4, 1877, and for over fourteen years the patent was in interference with the Bell Company as plaintiff and defendant, making such a pronounced case of each as to form an indelible element of prejudice.

The first claim in the patent includes everything of importance and reads as follows: "The method of producing in a circuit electrical undulations similar in form to sound waves, by causing the sound waves to vary the pressure between the electrodes in constant contact so as to strengthen and weaken the contact, and thereby increase and diminish the resistance of the circuit." The essential feature of this claim is comprised in the words "constant contact." Now remembering that there is no patent on an undulatory current, or upon the use of carbon in transmitters, we will take the Reis transmitter as an example. This is an instrument that has been held by the experts for the Bell company as an instrument, the electrodes of which are not in constant contact, and substitute carbon in place of the platinum and we have an instrument that will talk just as well as the Blake transmitter; in fact it then becomes a Blake transmitter which does not infringe the Berliner patent, for the reason that the electrodes are not in constant contact This can be demonstrated in a very simple manner. Arrange a hooded lamp and sheet of white paper so as to reflect a beam of light on the electrodes in such a manner as to show them in profile. Then with a camera throw an enlarged image on a white screen. As the electrodes intervene between the reflector and the camera they will appear dark on a white back ground.

By talking into the transmitter in a usual tone of voice it will at once be seen that the Blake transmitter is anything but a constant contact instrument, for the breaks will occur more or less with every syllable and that, too, when the instrument is adequate to do its best work. To be in constant contact the electrodes must be fixed and perpetually in contact.

In regard to the action by the Attorney-General to annul the Berliner patent there is no possibility of a termination until the patent expires from some other cause. It is simply a bunghole through which money is sucked out of the United States Treasury and will be kept open as long as possible for the benefit of a few patent lawyers with their poor relations acting as experts at a per diem that would make a New York politician turn green with envy. It is probable, however, that the case was instigated by the Bell company for the purpose of staving off other suits.

The object of the patent law is to encourage invention by allowing inventors to reap a just reward for their labor, and the courts will protect the inventor as far as it lies within their power to that end, but after that has been accomplished the courts cannot be expected and will not uphold doubtful patents for the purpose of supporting a monopoly against public policy, for it cannot be said that Bell and all connected with him have not had due compensation.

Electric Heaters.—On May 23 patents were granted to Mr. Samuel B. Jenkins, of Boston, on various electrical heating devices. They include an electric broiler, electric radiator, electric flat iron heater, electric soldering-iron, and an electric heater. The American Electric Heating Company, of Boston, controls all of these patents.

HEATING OF ARMATURES.[*]

By A. H. and C. E. Zimmerman.

Although so much depends upon the heating of armatures, but little attention appears to have been given to the study of a subject of such importance to the electrical engineer, in the design of electrical machinery. The losses in an armature caused by the transformation of electrical energy into heat are by no means negligible quantities, as the total amount of energy that we can obtain from a dynamo depends directly upon the temperature of the armature.

What will be the temperature of an armature when a certain amount of electrical energy is transformed into heat within that armature? How much heat will be liberated per square inch per degree rise in temperature above the temperature of the room? Will this quantity be different for different temperatures? Does the field aid in the escape of heat, or does it prevent its radiation? Also, what effect has the peripheral velocity on the amount of heat radiated? etc. Such questions as these seem to have passed almost unnoticed. Professor Harris J. Ryan, of Cornell University, has done some work in this direction, and it was through him that the present series of experiments was undertaken. M. Rechniewski has also determined by experiments on machines certain value for the heat radiated. In experimenting with dynamos or motors there is, however, some uncertainty as to the amount of heat generated. The loss in the coils of the armature can, of course, be accurately calculated. The losses in the iron core can be calculated approximately, but not accurately; for we do not know that the hysteresis loss due to the rotation of a mass of iron in a magnetic field is the same as that due to a variation in the magnetizing force, nor is the eddy current loss easily estimated. Owing to this uncertainty in the actual amount of heat generated, it was decided to construct a special form of apparatus so as to be able to measure accurately the amount of heat generated. Following is a description of the apparatus designed and constructed and employed in this determination:

The machine consists of a hollow cylinder of brass, mounted on an axis or shaft, so that it can be revolved between two pole-pieces, one end of the cylinder being detachable. In the interior of the cylinder is a coil of german silver wire; the coil is built up in the following manner: About 164 feet of german silver wire No. 17, A. W. G., was covered its entire length with glass beads; the beads were about $\frac{1}{4}''$ in diameter and from $\frac{1}{8}''$ to $\frac{1}{4}''$ in length. The wire, thus insulated, was wound in a coil over a hollow core of glass; the completed coil being $5\frac{5}{8}''$ long and about $5''$ in external diameter. This glass core with the surrounding coil was then slipped over the steel shaft and into place within the cylinder, care being taken to pull one terminal of the coil through a hole in the closed end of the cylinder, this terminal being well insulated from the cylinder. The remaining portion of the interior of the cylinder, not occupied by the coil, was filled with sand. The other terminal of the coil, after being well insulated, was pulled through a hole in the detachable end of the cylinder and this end fastened in place. Mounted on the shaft, but well insulated from it and from the cylinder, are two brass rings, one at each end of the cylinder. To each of these rings is attached one terminal of the german silver wire coil. Brushes for supplying current to the coil within the cylinder bear upon these rings. On the exterior of the cylinder a layer of muslin was wrapped, the muslin being well soaked with shellac. A coil of copper wire (No. 18 A. W. G.) was then wound on the cylinder. Attached to each end of the cylinder, but insulated from it, is a brass ring. The ends of the copper wire coil (which is wound on the exterior of the cylinder) are attached to these rings. Brushes bear on these rings and supply current to the exterior coil. (*To be continued.*)

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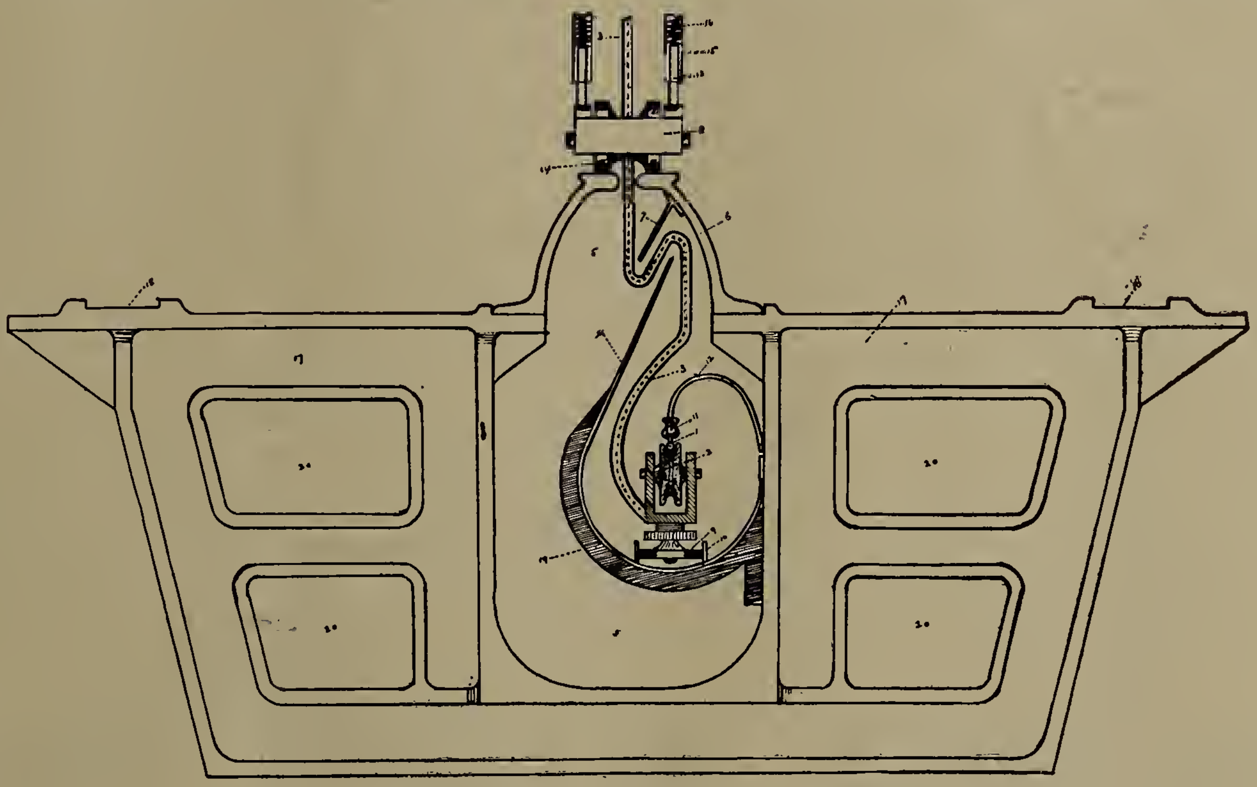
[*] Abstract of a paper read at the Tenth General Meeting of the American Institute of Electrical Engineers, New York, May 17, 1893.

CONDUIT RAILWAY SYSTEM.

Although some of the written matter on the "deadly trolley" is exaggerated, still electrical railroad men, as a rule, look to the future with the hope of seeing brought out a more perfected electrical railway system, that shall do away with the many objections and dangers incidental to overhead trolley for street use. As to the outcome of just what line of improvement the ideal system of the future will be, it is at the present time impossible to say. Conduit and storage battery systems both seem to be in the line of progress with, perhaps, the advantage at present with the former. If we only had perfectly clean streets, no floods, snows, and obliging and progressive municipal governments, the conduit system would become very popular at once. While it is true that these conditions are not with us to any great extent, it is also true that by the ingenuity of inventors, conduit systems are being brought forth which are surmounting the many obstacles in the path and making the conduit system a reliable and efficient one.



NEW ELECTRIC RAILWAY CONDUIT SYSTEM.

Our illustration shows a recently invented conduit system which has many points of merit and overcomes many of the objections hitherto brought forward. Some electrical conduit systems have been practically inoperative on account of the arcing of the current from the electrical conductor to surrounding parts, caused by the insulation used not being adequate to prevent it; and also on account of the drip from the slot rail opening and consequent flooding of the conduit, while in many others the numerous mechanical parts often get out of order. In the accompanying illustration of the system is shown a cross-section with yoke 17, as in cable road construction, which supports the conduit 5 and slot-rails 6. The chamber in which the conductor No. 1 is placed, is, by the overlaping cover No. 7, protected from floods until the water rises to within six inches of the street level. By the form of the trolley arm it becomes impossible for rain to drip into the conductor tube. Dirt or water falling through the streeet slot is prevented by the cover No. 7, from entering the tube which contains the electrical conductor, etc., and is gathered at the bottom of the large chamber. Ample air insulation is given by the conductor being placed centrally in the trolley chamber. The lateral and perpendicular motions of the trolley arm are provided for by the guide carriage and the point of contact of the trolley wheel on the trolley may be at the top or bottom of it. This promising system is brought out by the Electrical Conduit Traction Equipment Company, 94 Wall street, New York city.

MR. MASON AS A LECTURER.

Mr. James H. Mason, on the evening of May 31, delivered a lecture on "Electricity" at the Pilgrim Baptist Church, McDonough street and Patchen avenue, Brooklyn. Mr. Mason illustrated his lecture by a great number of experiments. A large battery of Mason cells was used to supply the necessary current. Fan motors were driven, among them, the new DeMott fan motor; incandescent lamps illuminated and the working of a number of electric household devices shown. The lecture was of a popular nature and did not enter into the technicalities of the science. A brief history of electricity was given and electro magnetic, static, Geissler tube and Faradic current experiments were performed. For the benefit of amateur electricians the method of constructing a cell of battery was shown. Questions were in order and a number availed themselves of this opportunity to get points on electrical matters. The lecture concluded with a phonographic entertainment.

QUESTIONS AND ANSWERS.

Correspondence from practical men upon topics of interest relating to electricity and kindred subjects, will find a place in this department.

The publishers, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Our readers are invited to avail themselves of this department when desirous of seeking or imparting information on questions of general interest.

HANDLING FREIGHT ON ELECTRIC ROADS.

The subject of transportation of freight on electric street railroads, from any one point along the line to any other is attracting much attention all over the country and it promises to open up a very useful field. Several new suburban routes have taken to handling freight. The system is of great utility in distributing freight to the outlying towns and cities surrounding large business centres. Passengers may be carried by day and freight by night. Electric roads connecting country towns could probably build up a very profitable freight traffic in a few years. Some street railways that have attempted to carry freight have been stopped by the municipal government holding their franchise, on the ground that permission was not given to carry on that business. New companies should see to it, that in their franchises they place a clause allowing them to adopt this system.

NOTES OF GENERAL INTEREST.

At the meeting in Paris on May 25, of the French Cable Company, the French shareholders achieved a complete victory over the American shareholders who sought to obtain control. A French board of directors was elected by a large majority.

A new electric launch named "Bonaventure" is to be placed on Deal Lake, N. J. The boat is 36 feet 4 inches long and carries 120 storage battery cells. It will run continuously for 12 hours without re-charging. The boat was constructed on plans made by A. S. Hickey, superintendent of the Seashore Electric Railway Company, and was tested on May 27.

Much activity is now being manifested in regard to the distribution of the power that is to be supplied by the Niagara Falls power plant. The Hamilton Radial Electric Railway Company of Hamilton, Ont., is to obtain its power from this source. The contract for wiring, and electrical machinery is in the hands of the Siemens and Halske Company. It is expected that by next October the Radial Railway Company will be able to supply power for all purposes needed in Hamilton.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, June 3, 1893.

Chas. S. Van Nuis, of Ajax switch fame, is in Chicago looking after his exhibit of switches at the World's Fair.

Mr. T. W. Ness, manufacturer of telephones and electrical supplies, Montreal, Can., is in the city, and gave the Electrical Age a call on Friday of this week.

The agents for the New York Insulated Wire Company for Yokohama and Japan are Messrs. Bagnall and Hillis who are at present in New York city on a short visit. These gentlemen are also agents for the Brush Electric Company. The New York Insulated Wire Company is the maker of the noted Grimshaw white core wires, etc.

The statement printed in our last issue to the effect that Dr. P. H. Van der Weyde was seriously ill at his home in Brooklyn was incorrect. That gentleman states emphatically that he is far from being ill.

Mr. F. A. Hine, of the firm of Hine & Robertson, 55 Cortlandt street, and inventor of the well-known Hine eliminator, died on May 26 last, after a long illness.

Messrs. Randolph & Sullinger, of Nassau Chambers, Nassau street, New York city, have recently installed some National India Rubber Company's insulated wires under very severe requirements. The wire has been for several weeks in very damp walls in the seven story office building at 136 Water street, and shows even under these adverse conditions a high insulation. C. H. Davis of the Equitable Building was the consulting engineer in this installation. This valuable wire is made by the National India Rubber Company, 487 Broadway, New York city, of which Mr. H. L. Burdick is manager.

Mr. S. Lenox Treadwell, of this city, has brought suit against Hugh R. Garden and Henry C. Davis to compel them to account for 2,500 shares of stock of the Consolidated Electric Light Company. Mr. Treadwell states that things are recorded in the minutes of the Executive Committee that never occurred, and that the minutes were doctored to the disadvantage of the stockholders Mr. Garden makes a general denial of the charges.

W. T. H.

OPEN CONTRACTS FOR ELECTRICAL BUSINESS.

OFFICIALLY ANNOUNCED.

Recorded for the benefit of subscribers to **ELECTRICAL AGE.**

All further available information can be obtained by our subscribers in applying by letter directed to Electrical Age, Dept. C, First Floor, World Building, New York. Reference must be made in each case of such application to the number in the following table and postage for answer must accompany the inquiry.

No.	Description of Work, or Contract.	Party to whom proposals must be directed.	Time up to which the proposals must be handed in, 1893.			Further information and specification obtainable through Electrical Age from	Amount, if any, to be deposited with bid in certified check.	Right to reject any bid received.	Special Remarks.
			Month	Day	Hour				
1*	To light the streets of a village (suburb).	Board of Trustees of the village, at their rooms in the Town Hall.	June	6	8 p.m.	The Village Engineer.	$2,000	Reserved.	
2*	Lighting the streets of the city with electric lights, for a term of five years, from July 1, 1894.	Common Council of the City.	Sept.	1	12 m.	Chairman of Committee.			
3*	500,000 El. Inc. all solid Lamps.	Company controling the patent.	July	1	12 m.	Secretary of Co.		Reserved.	
4	Construction and furnishing of an electric light plant, both arc and incandescent.	The president of the local Water and Electric Light Co., in the State of N. Y.							
5	Complete outfit for 150 incandescent and 30 arc lamps with guarantee as to power requirement.	The machine shop having contract for furnishing power and option on furnishing light plant.	July	1	6 p.m.				

Mr. R. R. Bowker, first vice-president of the Edison Electric Illuminating Co., New York, arrived from Europe on the steamer "Campania" on May 27.

TRADE NOTES.

The Railway Equipment Co., Chicago, Ill., has closed several contracts in the last few weeks for Type "G" overhead material, among them being the Tiffin, O., Electric Railway Company; Norristown, Pa., Electric Railway Co.; Second Avenue Passenger Railway Co., Pittsburg, Pa.; Pittsburg and West End Passenger Railway, Pittsburg, Pa., and Atlantic Avenue Railroad Company, Brooklyn. N. Y.

Mr. D. H. Barnet has recently been appointed manager of the Fibrone-Ferroloid Company, of Newark, N. J., and under his management the business is rapidly extending. This company manufactures everything in the insulation line for electrical instruments of every description.

The Electrical Age's Illustrated Record of Patents.

Issued May 30, 1893.

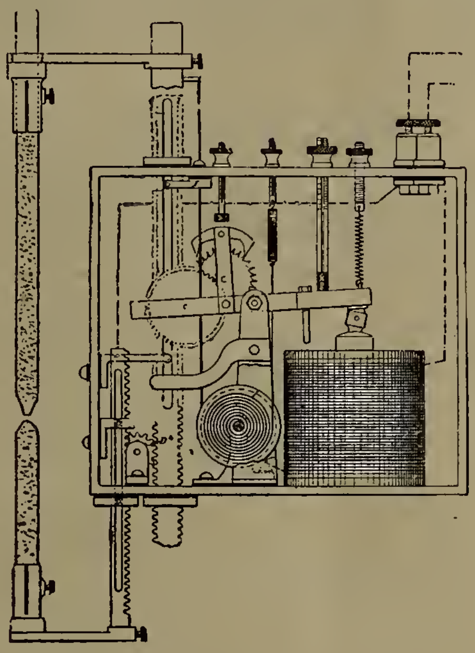
498,243. Telephone-Switch. Augustus G. Davis, Baltimore, Md. Filed Nov. 25, 1892.

498,248. Mold for the Formation of Type-Wheels. Thomas T. Eckert and Sigmund Bergmann, New York, N. Y., assignors to the Western Union Telegraph Company, same place. Filed Jan. 30, 1891.

498,269. Electric-Arc Lamp. Louis Hills, New York, N. Y. Filed Sept. 2, 1891.

498,289. Electrical Signaling System. Alfred S. McCaskey, Chicago, Ill. Filed July 29, 1892.

498,291. Automatic Telephone-Exchange System. Alfred S McCaskey, Chicago, Ill. Filed Aug. 25, 1892.



498,269—ELECTRIC ARC LAMP.

498,309. Telephone-Transmitter. Charles F. Scattergood, Albany, N. Y. Filed Dec. 14, 1892.

498,312. Electric-Lighting System. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 1, 1889. Renewed Nov. 4, 1890.

498,327. Pole-Piece for Dynamo Electric Machine, Elihu Thomson, Swampscott, assignor to the Thomson-Houston Electric Company, Boston, Mass. Filed Aug. 26, 1892.

498,355. Trolley-Catcher. Charles A. Lord, San Francisco, Cal., assignor of one-half to T. A. Kirkpatrick, same place. Filed July 12, 1892.

498,372. Electric Registering Device. Barton B. Ward, New York, N. Y. Filed May 28, 1890.

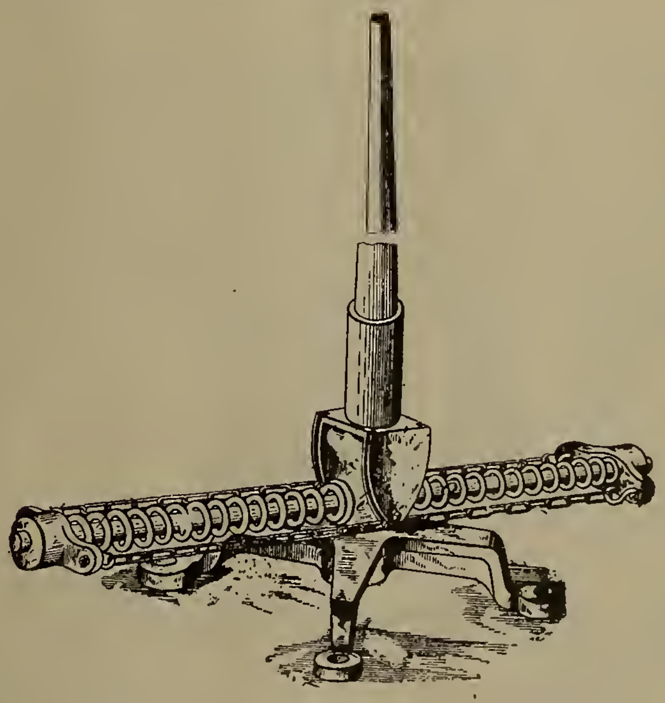
498,374. Adapter for Lamp-Sockets. Henry P. Ball, Schenectady, assignor to the Edison General Electric Company, New York, N. Y. Filed July 6, 1892.

498,387. Electric-Arc Lamp. Frederick D'A. Goold, New York, N. Y., assignor to Edison General Electric Company, same place. Filed Nov. 7, 1891. Renewed Dec. 31, 1892.

498,403. Electric-Railway Trolley. Patrick F. O'Shaughnessy, New York, N. Y., assignor to the Sprague Electric Railway and Motor Company, same place. Filed Sept. 27, 1888.

498,407. Insulated Binding-Post. Richard H. Rich, Beverly, Mass. Filed July 15, 1892.

498,422. Galvanic Battery. William Burnley, North East, Pa. Filed June 15, 1892.



498,722—TROLLEY FOR ELECTRIC CARS.

498,435. Electric-Railway Trolley. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Original application filed June 7, 1888. Divided and application filed Nov. 8, 1888. Again divided and this application filed Mar. 4, 1892.

498,448. Fire-Alarm System. Joseph Sachs, New York, N. Y. Filed June 24, 1892.

498,468. Electric Alarm-Clock. William M. Fowler, Milford, Conn. Filed May 6, 1892.

498,503. Index for Telephones. Frank S. Blanchard, Worcester, Mass. Filed Oct. 10, 1892.

498,517. Cable-Grip. John Kratz, Baltimore, Md. Filed April 3, 1893.

PATENTS—Continued.

498,519. Electric Perforating-pen. Aaron D. Lewis, Canton, Mo., and Silas Witherell, Fort Madison, Iowa; said Witherell assignor to said Lewis. Filed April 23, 1892.

498,529. Printing Telegraph. Edward V. Baillard, New Utrecht, N. Y. Filed Feb. 4, 1893.

498,537. Dynamo-Electric machine. Charles E. Dressler, New York, N. Y. Filed Oct. 6, 1891.

498,538. Electric Generator or Motor. Charles E. Dressler, New York, N. Y. Filed Sept. 15, 1892.

498,539. Junction-Block for Electric Fixtures. Frederick A. Duggan, Trenton, N. J. Filed Feb. 24, 1893.

498,560. Electric Cut-Out. William P. Mashinter, Montreal, Canada, assignor of two-thirds to Herbert Montague Linnell and Charles Morton, same place. Filed July 5, 1892.

498,566. Electric Arc-Lamp. Paul Nordmann, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Nov. 16, 1892. Patented in Germany Jan. 24, 1890, No. 56,022; in Austria-Hungary Oct. 11, 1890; No. 5,438 and No. 28,316; in France Oct. 15, 1890, No. 208,882; in Belgium Oct. 15, 1890, No. 92,326, and in England Sept. 12, 1891, No. 17,940.

498,570. Suspension Device for Electric Lamps. James J. Renehan, New Britain, Conn. Filed Sept. 29, 1892.

498,577. Electric Locomotive. Alfred Schmid, Allegheny, assignor to the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa. Filed Nov. 16, 1891.

498,585. Electrical Rotary Motor. William J. Still, Toronto, Canada. Filed Dec 28, 1891. Patented in England Feb. 9, 1892, No. 2,544; in Austria-Hungary, Feb. 19, 1892, No. 9,764 and No. 26,096; in Switzerland Feb. 23, 1892, No. 4,653; in Norway Mar. 3, 1892, No. 2,634; in France Mar. 12, 1892, No. 220,088; in Belgium Mar. 12, 1892, No. 98,760, and in Italy Mar. 17, 1892, 31,499/15.

498,603. System of Supplying Currents to Electric Railways. Charles Zipernowsky, Buda-Pesth, Austria-Hungary. Filed Mar. 7, 1891.

498,604. Electric-Arc Lamp. Hugh Alexander, Brooklyn, N. Y. Filed Apr. 19, 1890. Renewed Nov. 4, 1892.

498,710. Electric Time-Alarm. Charles S. Gibson. South New Berlin, N. Y. Filed Oct. 12, 1892.

498,722. Trolley for Electric Cars. Robert D. Nuttall, Allegheny, Pa. Filed July 14, 1891.

498,723. Electric Railway Trolley. Robert D. Nuttall, Allegheny, Pa. Filed May 10, 1892.

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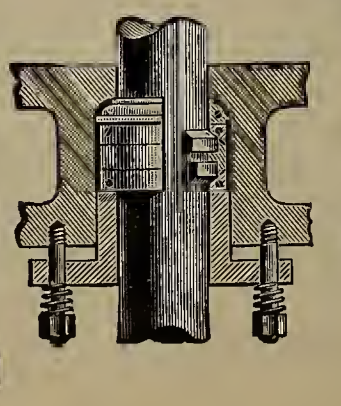

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ELECTRICAL AGE

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MR. EDISON'S FUTURE WORK.

That tireless inventor, Mr. Thomas A. Edison, has been again heard from as regards the problems he has undertaken to solve. He has not, by any means, given up his idea of devising ways and means of obtaining the energy of coal in a manner more direct than the present wasteful methods, and he promises to soon resume experiments along this line. He has had enough of the machinations of Wall street, however, and what he does hereafter, will be through his own enterprise entirely. He proposes to control all his future inventions himself, without the aid of Wall street.

INJUNCTION SUIT.

The Edison Electric Light Company and the Edison Electric Illuminating Company of New York, filed a complaint last week in the United States Circuit Court, against the proprietors of the Imperial Hotel, the proprietors of the Holland House, and the owner of the building No. 15 Spruce street, all in this city, to restrain them from using any other than the Edison incandescent lamp in lighting their premises. The complainants also ask the court to compel the defendants to pay damages to the Edison Company for using the Westinghouse lamp. This action is based on the decision of the United States Circuit Court of Appeals of October last, in the case of the infringement of patent No. 223,898, which enjoined the Westinghouse Company from making lamps in infringement of this patent. The Edison Company, however, in the present instance, it is said, cannot sue the manufacturers of the lamps in question, but seeks to attain the same object by restraining the users thereof.

ARMATURE DESIGN.

In this issue we publish the concluding portion of the article on "Heating of Armatures" by A. H. and C. E. E. Zimmerman. The subject treated is an interesting one and of importance to the designer of economical dynamo electric machines. In this business as well as other branches of electrical industry the custom of guessing at the various properties of a machine is going out of vogue and the far better one, of absolute measurement, is coming in. Anyone knows that an armature when in action becomes heated; in some old fashioned machines the heating effect used to be excessive. A knowledge of the rate at which heat is radiated from a revolving armature will be a help to designers, and the results obtained by the gentlemen named, from the experimental machine are of value. It is to be hoped that further experiments will be carried on either by the authors or other investigators giving data on the effects of air gap, size of armature and other relative factors.

FIRE RISKS.

The risk by fire in an electric light or power installation is a matter of great interest to possible users of electric power. Much has been said on this subject and the origin of many fires have been ignorantly, or maliciously, laid at the door of the innocent wires. It does not seem to be so bad in that way now as it was a few years ago, when nearly all mysterious fires, if the buildings were near an electric line, were said to be due to electric wiring. On another page we publish an article on "Fire Risks in Electric Insulation," by Frederick A. C. Perrine. The safeguards and the present means of insulation in the modern electric installation is discussed. Experience goes to show that a properly insulated electric installation may be considered as perfectly safe.

WATER POWER ELECTRIC PLANTS.

Water power used in connection with electric power and light installations opens up to the present and future engineer a broad and interesting field of useful application. It seems to be an ideal system as it turns the forces of nature almost directly into forms useful to us in our complex civilization. Already a promising start has been made in this line in the United States, especially in its Western portion. Though small heads of water may be used successfully, there are many places in mountain districts where the body of water has a small volume but a great head or pressure. To utilize the power in such cases high speed water wheels have been devised which are very economical.

Our illustration shows the Pelton water wheels directly connected to an electric generator as installed in the plant of the Standard Mining Company, Bodie, Cal. The wheels are mounted on one shaft and connected to the generator shaft by an insulated coupling. The power from this plant is transmitted 13 miles and is used for general mining purposes. The four water wheels are each 21 inches in diameter and with a speed of 860 revolutions, running under a head of 340 feet, has a combined capacity of 250-horse power. With a lower speed generator or a higher head of water, larger wheels and less of them would have been used. The Pelton differential automatic governor shown on the left, maintains a uniform speed under instant and wide variations of load. As shown by the illustration the plant presents a neat compact appearance.

The Pelton Water Wheel Company is building a 500-horse power belt connected plant, to go to South Africa. Orders also come from England for this excellent wheel.

The main office of the Pelton Water Wheel Company is 121 Main street, San Francisco, Cal., and the New York office is at 143 Liberty street. The factories are in San Francisco and New York.

THE "ACME" PORTABLE TESTING SET.

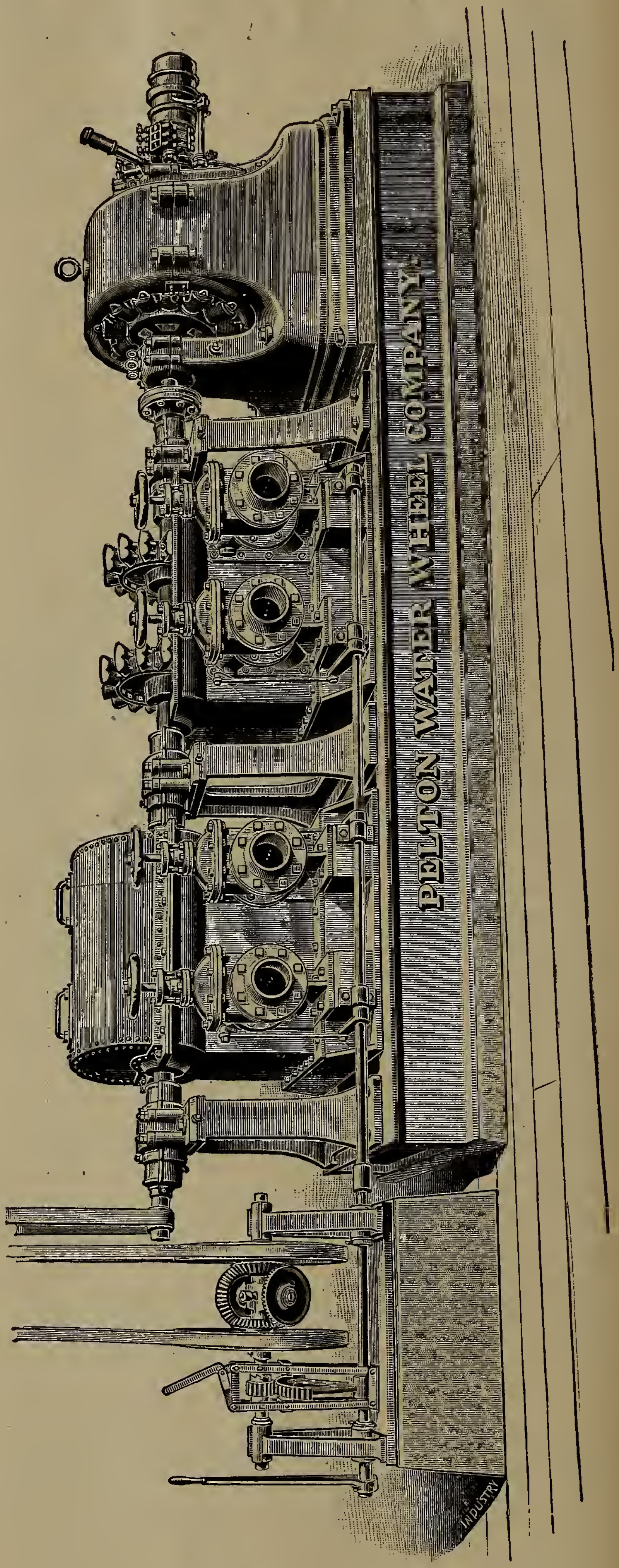
The rapid and correct measurement of resistance under varying circumstances is an important factor in electrical engineering, and for this purpose it is highly essential to use apparatus that properly meets the requirements of everyday practical work.

In this connection the "Acme" Portable Testing Set, herewith illustrated and described, deserves more than passing notice, as being what its name implies, the most perfect commercial instrument for testing resistance yet placed on the market. It embodies the result of long experience on the part of Queen & Co. in manufacturing such goods, and will be recognized as even more complete, compact and convenient than their previous sets which have met with much favor wherever used.

It comprises a Wheatstone bridge, rheostat, D'Arsonval galvanometer, "Aluminum-Iodine" battery and double contact key, all contained in a handsome mahogany case, of outside dimensions 8¼" x 5⅜" x 5", and weighing less than six pounds complete. The leather case illustrated (Fig. 1) is very convenient when the apparatus is used by inspecting engineers, as it can be slung over the shoulder and carried as readily as a small hand bag.

The coils in both bridge and rheostat are wound with the celebrated platinoid wire, which long use has conclusively shown to be far superior to German silver, and adjustments are made with great care; an accuracy of one-fifth of one per cent. being guaranteed. The arrangement is similar to the "Post Office" design, with three coils in each bridge arm, and eighteen coils in the rheostat, giving a total range by means of the reversing attachment of from .001 ohm to 11,110,000 ohms.

The galvanometer is a modified form of the D'Arsonval type, made specially for the purpose, and proves far superior for actual testing to other styles. It is strongly built, hence not liable to injury, and is perfectly deadbeat, so that readings can be taken very rapidly. Magnetic fields and mechanical vibrations produce no effect



PELTON WATER WHEELS.

whatever, and the instrument will give as accurate indications in the street, on shipboard or in a dynamo room as in a college laboratory.

The battery is of the new "Aluminum-Iodine" form with E. M. F. of $1\frac{4}{10}$ volts per cell, or equivalent to a total of 17 volts; this is practically 50 per cent. more than the ordinary chloride of silver cells. Should the battery be exhausted from long use, it can readily be removed from the box and renewed at slight expense.

The apparatus complete is shown in Fig. 1, while Figs. 2 and 3 indicate the arrangement of working parts. In Fig. 2, A and B represent the two proportional bridge arms, R is the adjustable rheostat, and X the unknown resistance or line. In Fig. 3 the arm A of Fig. 2 is equivalent to the coils 1, 10, 100 on the left hand centre row, and the arm B to the coils 10, 100, 1,000 on the right hand of the same row. The rheostat R corresponds to the coils of the top and bottom rows, aggregating 11,110 ohms, and X the unknown quantity is connected between the two binding posts at the lower left hand corner.

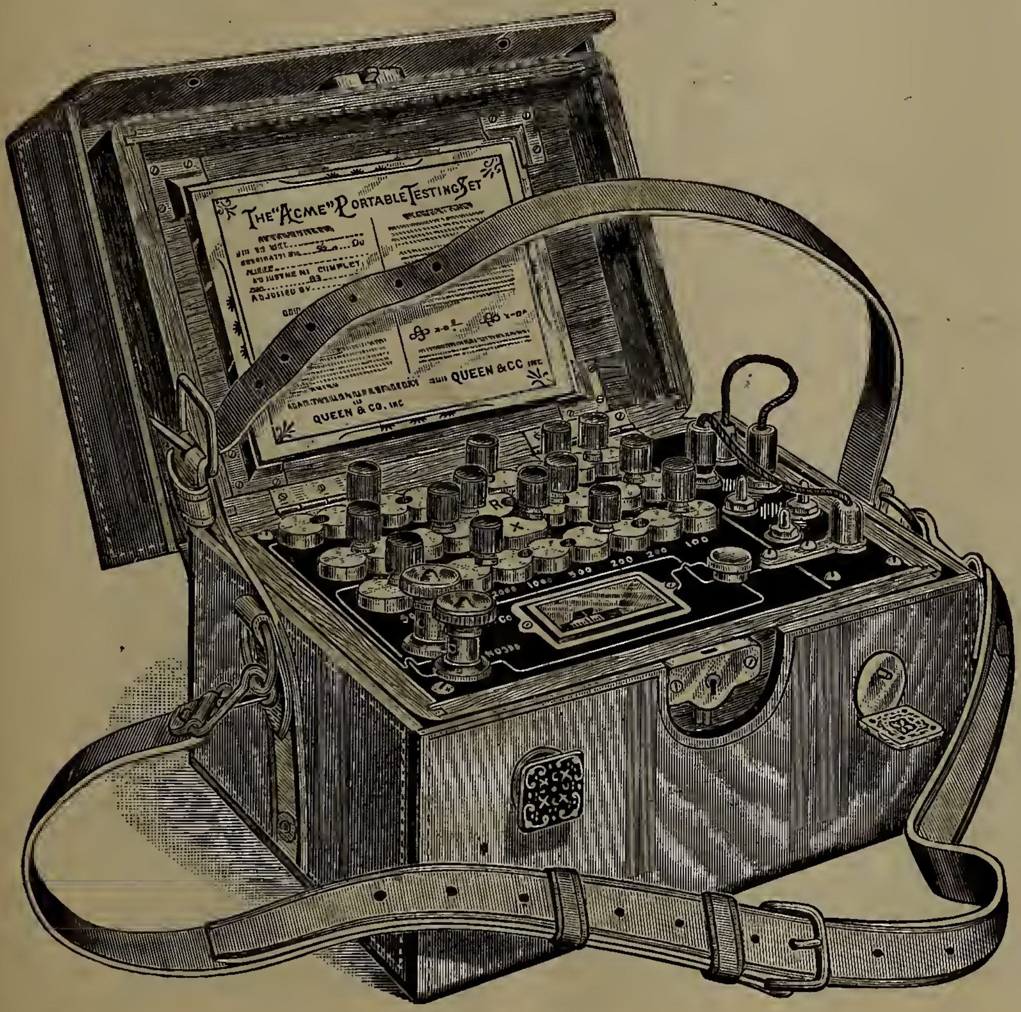

The "Acme" Portable Testing Set
Queen & Co. Inc.
R
X

FIG. 1.

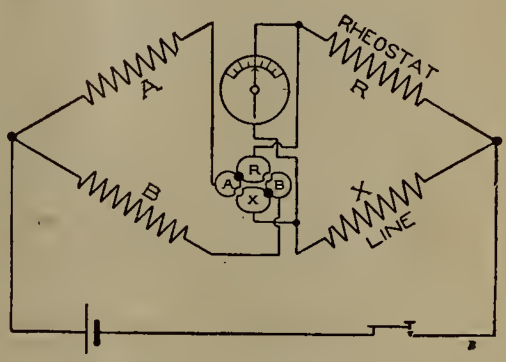


FIG. 2.

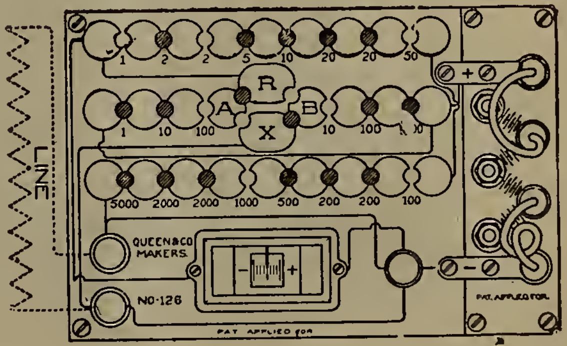


FIG. 3.

In Fig. 3 the blocks marked "A," "R," "B" and "X" are connected to the bridge arms and are the same as shown in the centre of Fig. 2. They constitute the "reversing arrangement" whereby the bridge arms may be interchanged and six coils be made to do the work of eight. Thus, when one plug is placed between A and R and another between X and B, the order of the arms working clockwise and beginning with R will be, R : X : : B : A. If the plugs are changed so as to connect A to X and R to B the order will be R : X : : A : B. By this means it also becomes possible to readily detect inaccuracies in the bridge ratios should any exist, and to eliminate them entirely in work. Thus, if the two 100 ohm coils of the proportional arms are slightly different this fact becomes evident in practice by reversing and balancing them. If with a given unknown resistance the resistance in the rheostat has a different value in one case than in the other, the two bridge cells must be slightly different and the correct value of the unknown will be the mean of the two rheostat resistances used in obtaining the two balances.

To use the apparatus the terminals of the resistance to be measured should be connected to the binding posts mentioned, and an approximate estimate formed of its value. For example, suppose it is about 400 ohms, the proper method of procedure will then be as follows:

Plug A to R and X to B, and unplug the 100 ohm coil in both A and B and also the 500 ohm coil in the rheostat. Connect one cell of battery and close the key for an instant (it is always best to start with very small battery power, as in that case no harm can be done if the unknown resistance is estimated far from its proper value). If the galvanometer needle swings to plus, the resistance unplugged in the rheostat arm is too high; if to minus, it is too low. By altering the unplugged resistance of the rheostat arm and if necessary increasing the battery power, a "balance" can quickly be effected and thus the value of the unknown determined to within 1 ohm. Should the resistance be low, for instance 1 ohms, the same plan should be followed except that the two 10 ohm coils of the bridge should be used instead of the 100 ohm coil. If the resistance be higher than the total resistance of the rheostat, for example 800,000 ohms, plug A to X and B to R, and unplug 10 in A and 1,000 in B; the proportion will then be as 1 is to 100 and a balance will be obtained when 8,000 ohms is unplugged in the rheostat.

From the preceding description it will be evident that the apparatus is remarkably simple in operation, so that an inexperienced lineman can learn to use it in a short time. The great value of such an instrument will be evident to those who have used the forms heretofore obtainable, which usually necessitates the handling of two boxes—one for the rheostat, galvanometer and bridge, and a separate one for the battery.

The manufacturers, Queen & Co., incorporated, Philadelphia, are anticipating a very large demand, and have arranged to turn out the sets in sufficient quantity to fill all orders promptly.

AN 80-INCH LEATHER BELT.

The Shultz Belting Company of St. Louis, has recently manufactured the largest hide belt ever produced. It is 80 inches in width and is to be used in the power station of the Toledo Electric Street Railway Company, Toledo, Ohio.

The belts made by this company are only tanned on the surface; the interior is raw hide softened and made pliable; the advantages of tanned leather and rawhide thus being combined. Because of its strength, pliability and adhesiveness it is adapted for small high speed pulleys and for running on a twist.

The middle belt in our illustration is the 80-inch one for Toledo. The 72 inch belt on the left of the illustration is installed in the St. Louis and Suburban Railway Company's power house at St Louis. The other belt, 60 inches in width, is for the Denver Tramway Company, Denver, Col. The 72-inch belt will be used for transmitting the power of a 750-H. P. Hamilton-Corliss engine to two 360-H. P., T.-H. generators. Mr. A. B. Laurence is the New York manager of this company.

LEATHER BELT SIX FEET, EIGHT INCHES WIDE

ELECTRIC STREET RAILWAY IN BUDA-PESTH.

Under date of March 25 last, U. S. Consul Edward P. T. Hammond, at Buda-Pesth, gives some interesting statistics regarding the electric street railway system in that city, to the State Department. Mr. Hammond's report is as follows:

The Siemens-Halske electric street railway system was introduced into Buda-Pesth three years ago, and is now in operation on nearly seven miles of double-tracked road. Sixty cars, each with a seating capacity for thirty-two persons, are run over the line at an average speed of 12 miles an hour. The electric current is transmitted from a central power station through an underground conduit, from which connection is made to the motor of the cars.

The service has been exceedingly satisfactory to the public, the only short interruptions having been caused on a few occasions by unusually heavy falls of snow. The rate of speed could easily be doubled, but municipal regulations forbid any increase.

The fare charged varies from 2½ to 4 cents, according to the distance. Transfer tickets are issued for 4 cents.

The company operating the road has obtained concessions for an extension of about three miles over some of the principal streets, and further concessions will probably be secured.

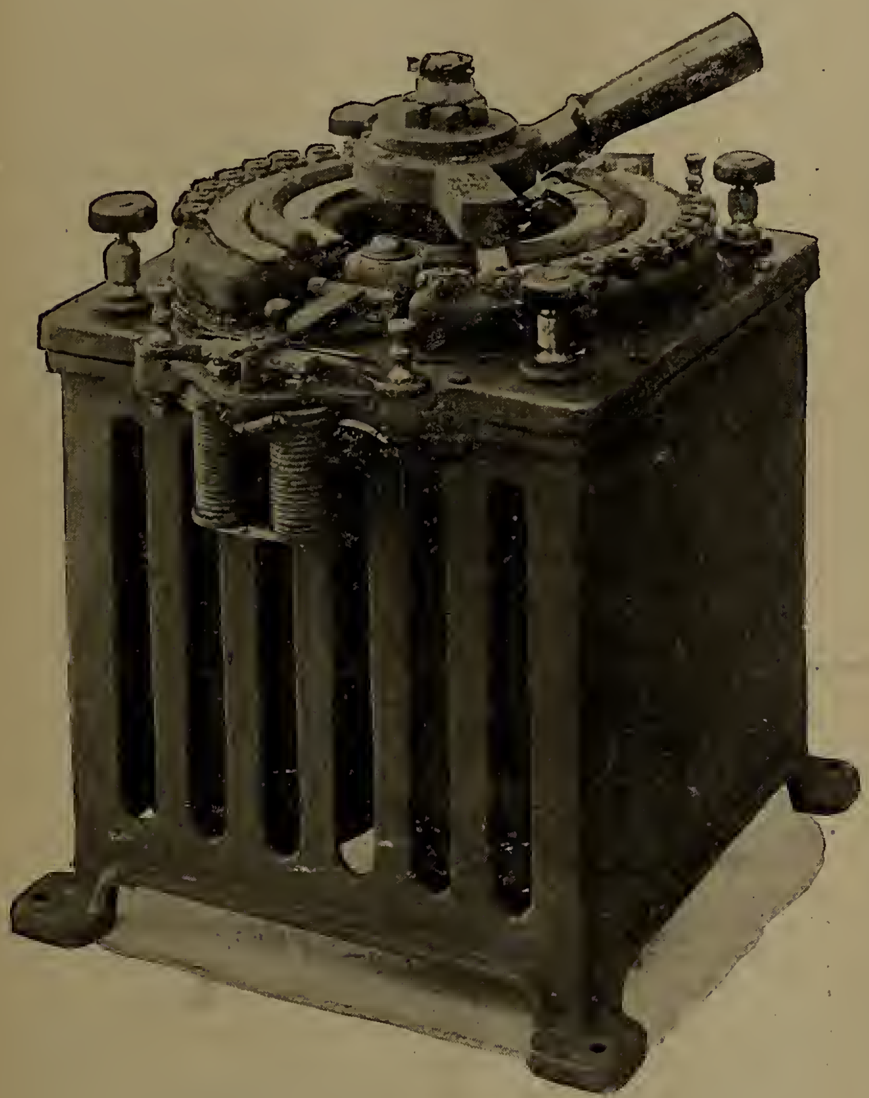
The following facts in relation to the construction and equipment of the railway were furnished by parties in this city (the company publishing no reports): Cost of roadbed (rails, excavating, masonry, paving, and switches), about $2,880 per mile of single track; cost of cars, including motors, $6,000 each; weight of cars, including motor, five tons; cost of buildings, $15,000; five boilers, with grates and masonry, $20,000; machinery (engines, dynamos, switchboard, etc.), $70,000; cost of running one car per mile (maintenance of track, labor at power station, fuel, employés on cars, etc.), 5½ cents.

An automatic electric switch was practically tested in Astoria, L. I., on June 8, with successful results.

AUTOMATIC SAFETY SWITCH AND RHEOSTAT.

The rapid increase in the number of stationary motors used on railway and power circuits has led to a demand for a satisfactory automatic switch for the protection of the motor. It frequently happens, on circuits where the load is variable, that the circuit is opened at the station by the circuit breakers. The circuit is always closed, as soon as possible, and unless the rheostat or main switch of the motor has meanwhile been opened, the current is turned on to the motor when no resistance is in its armature circuit. In such a case a very large current flows through the armature and does damage by blowing fuses, flashing around the commutator, and, in many cases, burning out the armature.

For the protection of motors, under such circumstances, the General Electric Company has devised an Automatic Safety Switch and Rheostat, which takes the place of the ordinary double-pole switch and starting rheostat, and acts as an automatic circuit breaker to protect the motor from injury by any abnormal condition of load or power supply.



AUTOMATIC SAFETY SWITCH AND RHEOSTAT.

The rheostat proper consists of resistance wire wound upon spools of incombustible materials, which are fastened to the back of the switch base. The latter is supported by the iron box, which incloses the spools. On the front of the switch base are mounted the switch contacts, the switch arm, and the automatic releasing mechanism.

The switch is made up of two segments of a metal ring to which the line wires are connected, two sets of resistance points arranged on arcs of a circle, just outside of and concentric with the line rings, and a switch arm, carrying a brush at each end, which makes connection between the line rings and the resistance points on the same side of the switch arm. A spiral spring tends to return the switch arm to the *off* position, and it can be left in the *on* position only when the motor is running under normal conditions. When the arm is in "*off*" position, both sides of the line are open, and no current can enter the motor.

Two electro-magnets govern the automatic action of the switch. One of these, known as the Detent Magnet is connected in series with the field coils of the motor and governs a detent pin, which holds the switch arm in the "*on*" position after starting the motor, so long as the field current is maintained in the magnet. The other magnet, called the Relay Magnet, is in the main circuit, and controls an armature, which, when attracted, short circuits the Detent Magnet.

In case the circuit is opened for an appreciable length of time the current in the Detent Magnet ceases, and the switch arm being released flies round to the "off" position.

If the field circuit of the motor is broken, the switch arm is released, and the motor is shut down.

The switch also acts automatically to shut down the motor in case of dangerous overload. The armature of the Relay Magnet is so adjusted that when the current increases beyond the safe load of the motor, it is attracted, and the motor is shut down by short circuiting the Detent Magnet.

By connecting push buttons to wires running from the Detent Magnet, the motor may be shut down from any desired part of the building. This is a very valuable feature, and it furnishes a means of stopping the machinery promptly in case of accident.

It will easily be seen from the foregoing that that the Automatic Safety Switch and Rheostat furnishes complete protection for the motor and makes it impossible to injure it by carelessness of the operator, accidents to the line or to the driven machinery, or by purposely overloading it.

THE TELEGRAPH IN CHINA.

Mr. Charles Denby, Minister of the United States, in Peking, China, reports to the State Department, under date of March 4, last, that the Chinese land telegraph line has been joined to the Russian system. Messages can now be sent to any part of the world from any telegraph station in China.

Since this connection was made the cable companies have added 15 per cent. to their charges, but messages may be sent over the Chinese lines at the former rate—$2 per word, the cost of transmission across the Atlantic being added.

The Chinese system now reaches Helampo, in the north, where the connection is made with the Russian lines; Aichow, in Hainan, in the south; Wenchuen, in Kirin, in the northeast; Takao, in Formosa, in the southeast; Suchan, in Kansu, in the northwest; and Zengyueh, close to the Burmah frontier, in the southwest. The only province which is not reached by telegraph is Hunan, which still remains opposed to all foreign innovations.

There are four stations in Anhui, eight in Chekiang, eleven in Chihli, four in Korea, nine in Fukien, ten in Formosa, three in Heillungchiang, one in Honan, seven in Hupeh, six in Kansu, four in Kiangsi, four in Kirin, nine in Kuangsi, thirty-four in Kuangtung, two in Kuischow, three in Shansi, fourteen in Shantung, two in Shensi, six in Shingking, six in Szechuan, and ten in Yunnan, or one hundred and sixty-seven in all.

The service is rapid and satisfactory. Parties sending messages have the right to designate whether they shall go over the cable lines or the land lines.

ELECTRO-MECHANICAL DEVICES.

We give herewith a few illustrations of electro-mechanical devices which possess some features of interest to electrical people.

Figs. 1, 2 and 3 represent tell-tale floats for use in connection with water tanks and reservoirs, for the purpose of giving an alarm when the water has reached the highest or lowest level allowable. The single float is arranged to give an alarm when the tank is full of water, or when the water is low, and the device with the double floats sounds the bell when the low or high water limit has been reached.

The chief merit of this apparatus is that the electrical connections are all outside of the tank, consequently there is no danger of short circuiting on account of dampness, etc. The connections are made in the little box shown at the top of the tube, above the tank. When the top float is lifted upward by the rising water, it forces a rod upward through the tube. The upper end of the rod comes in contact with one of the electrodes and forces it against the other electrode, thus closing the circuit and ringing the alarm. When the falling water gets below a certain point the lower float is carried with it, pulling the rod down through the tube and closing another circuit in a similar manner. The form of double floats shown in Fig. 2 is designed for a closed tank, and that shown in Fig. 3 for an open tank.

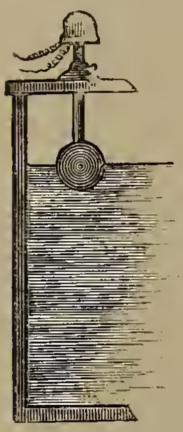


FIG. 1.

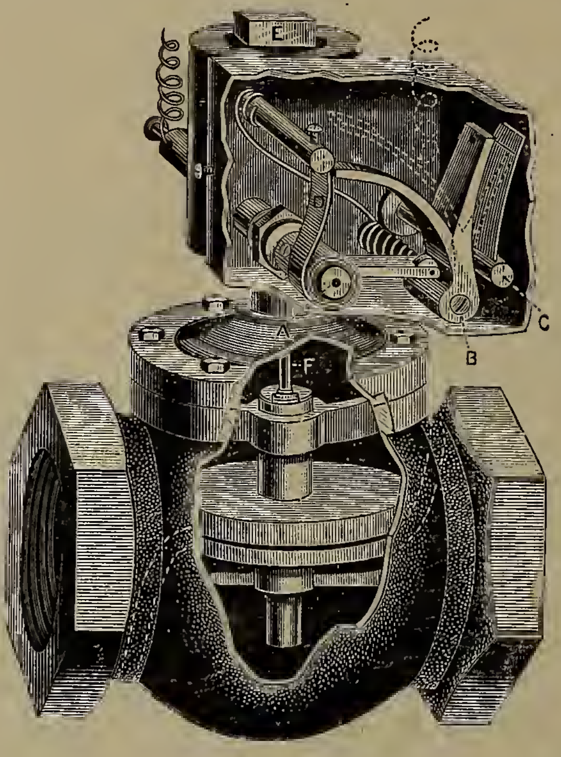


FIG. 5.

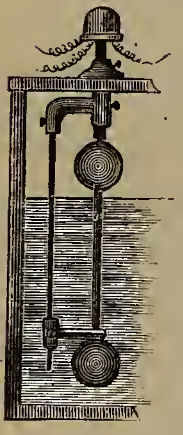


FIG. 2.

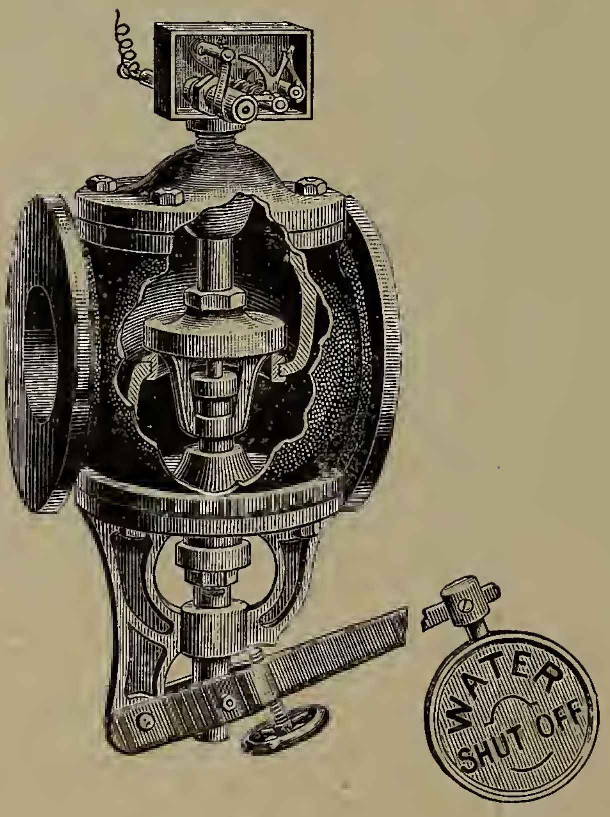


FIG. 6.

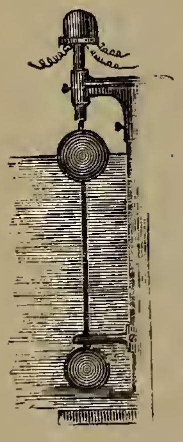


FIG. 3.

Fig. 4 represents an electric safety stop, which is designed to disconnect a line of shafting, or a machine, from the source of power, from any distant point by simply pressing a button. It can be applied to friction clutches or loose pulleys, and is always certain and effective in its action. When a button is pushed, the electric current is closed and the magnet inside of the box releases the trip, thus allowing the lever to be pulled down by the weight shown in the illustration. This, it will be seen, will shift the belt to the loose pulley.

This is a valuable device for use in establishments where power is transmitted by shafting. In case of accident, or sudden emergency, the machinery can be stopped at once by pressing a button. Buttons are placed at convenient points.

Two cells of battery are sufficient to operate this device.

Figs. 5 and 6 show an automatic check and alarm valve, and an automatic combination valve. These are used in connection with automatic sprinkler systems, and in case the sprinkler is opened by fire, or a leak takes place on the system, an alarm is sounded by an electric bell. This is done by the pressure of the water against a diaphragm in the valve. A very slight pressure is necessary to force the diaphragm upwards, and the vertical rod attached to the diaphragm in its upward movement closes the electrical circuit, thus giving the alarm. This device is very sensitive in its operation, and never sticks, and presents no impediment to the flow of water.

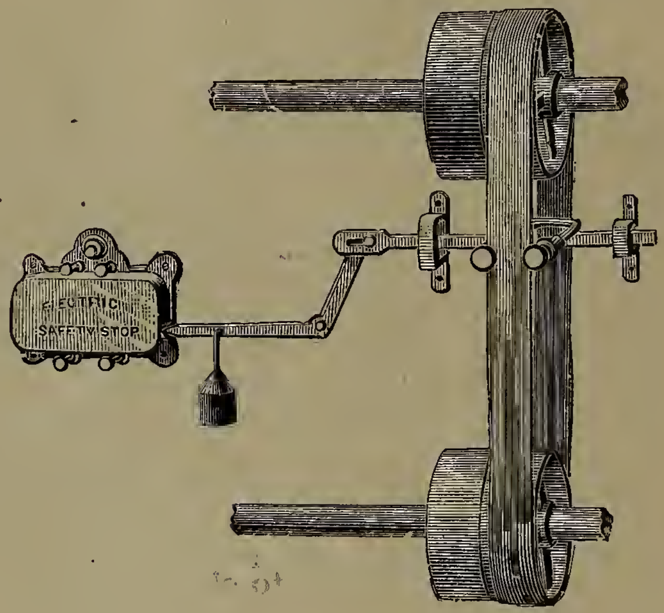


FIG. 4.

The automatic combination valve combines the features of the check and alarm valve with that of a quick stop and indicator valve, and is used where it is desirable to dispense with a separate stop and indicator valve

All of these devices are manufactured and installed by Mr. Gustave S. Neu, electric engineer and contractor, 9 and 11 Franklin street, New York city.

Legal.—By order of the Court, Mr. R. E. Rust, who was appointed Receiver of the National Electric Manufacturing Company, of Eau Claire, Wis., will continue the business of the corporation, and will promptly fill all orders for the manufacture and sale of electrical machinery and appliances.

HEATING OF ARMATURES.

By A. H. and C. E. E. Zimmerman.

(*Continued from page 366.*)

The temperature of the cylinder at any moment can be measured by finding the resistance of the copper wire coil. The temperature coefficient of the wire being obtained by previous experiment. The object of this latter construction is to measure the temperature while the cylinder is revolving.

A current is sent through the interior coil, and heat is thereby generated; the energy thus transformed into heat being measured by the product of the resistance of the coil and the square of the current flowing through it. Or as the resistance is a variable quantity, the energy is better measured by the product of the current flowing through the coil and the difference of potential at its terminals. By placing an ammeter in the circuit and connecting a voltmeter to the terminals of the coil, we can measure the exact rate at which heat is developed, and thus the total quantity of heat developed during any period of time. The heat produced, raises the temperature of the wire, and thus that of the cylinder. The above gives the essential features of the construction.

The method pursued was to make several series of runs; the amount of the cylindrical surface of the cylinder covered by the field being the same for each series, while the speed was varied from zero to about 2,000 revolutions per minute, the speed being kept constant during each run. Four speeds were used, viz.—3,000 ft. per minute, 2,000 ft. per minute, 1,000 ft. per minute and a fourth series with the cylinder at rest Each of these series will show the effect of different peripheral velocities. To show the effect of the field in aiding or in preventing the radiation of heat, four sets of fields were used—one covering 100 per cent. of the cylindrical surface of the armature, another covering 75 per cent., a third covering 50 per cent. and a fourth run with no fields at all. A pair of 25 per cent. fields were also made but were not used because of the comparatively slight difference between the radiation with no fields and that with 50 per cent. fields. The object of the above method is to obtain curves showing the effect of speed, and another set showing the effect of the field in preventing or in aiding the radiation or conduction of heat from the armature surface. To find the relation of the amount of heat radiated to the temperature of the cylinder, the rate at which heat is developed in the cylinder was varied from 50 to 400 watts, the rate being kept as near constant as practicable during each run. An examination of the above will show that a series of runs was made with each pair of pole-pieces and that for each run in the series, a second series was made with different peripheral velocities, and again for each peripheral velocity a series of runs was made, each with a different amount of heat developed per second within the cylinder.

The method used in each run was as follows: Being unable to obtain the requisite instruments we were compelled to abandon the proposed method of finding the temperature of the cylinder, and substitute a thermometer. While this method is not quite as accurate as that intended when the apparatus was built, nevertheless it gives very good results, as can be seen from the figures obtained agree very well when considered together. A current was sent through the coil within the cylinder and heat produced, thus raising the temperature of the cylinder. The rate at which heat was developed was kept constant during each run. To do this it was found necessary to place a resistance that could be easily varied in series with the coil, for, owing to the great range of temperature the resistance of the coil varied greatly. Runs were to be made long enough to allow the cylinder to reach constant temperature; for when the temperature becomes constant the amount of heat radiated must be exactly equal to the amount generated. Hence we have a very accurate method for determining the amount of heat radiated from the surface of the cylinder. However, one great difficulty was encountered; being unable to make use of the coil on the exterior of the cylinder, how were we to ascertain when the cylinder had reached constant temperature? A number of runs were made, and although continued for over three hours, the result obtained did not agree as well as was expected. The reason for this disagreement it was thought was, that the runs were not long enough, that is the temperature of the cylinder had not become constant when the cylinder was stopped and the temperature taken. To ensure that the temperature had become constant, it was found best to adopt the following methods:—The cylinder was allowed to remain at rest or revolved slowly, and a current sent through it until the temperature had become from 5 per cent. to 10 per cent. higher than the calculated temperature. The run was then started and continued for a length of time varying from one and a half to three hours according to the conditions of the run By the calculated temperature is meant that calculated from runs which had been continued long enough to ensure constant temperature; in some cases over four hours. By this method greater accuracy was obtained and we were more certain of our results. To obtain the temperature of the cylinder a thermometer was placed on the cylinder, and the bulb covered with a piece of cotton waste, the cylinder being first brought to rest. In order to obtain the temperature as quickly as possible after the cylinder had been brought to rest, it was found advantageous to heat the thermometer to a temperature higher than that at which the cylinder was calculated to be, and allow it to fall to the correct temperature. The temperature of the atmosphere was also taken. The difference between the two is the rise in temperature due to the heat generated within the cylinder.

In the apparatus used, the area of the curved surface of the cylinder is 123 sq. inches, its radius being 3 $\frac{1}{32}$ inches, and its length 6 $\frac{7}{16}$ inches. The area of the two ends is 57 sq. inches, with a mean radius of about two inches. When the peripheral velocity of the cylindrical surface of the cylinder is 3,000 feet per min., the mean velocity of the ends is about 2,000 feet per min. As the heat liberated at 3,000 ft. is considerably greater than that liberated at 2,000 ft., the peripheral velocities given in the curves are not the true peripheral velocities of the entire surface of the cylinder, or in other words, the amount of heat liberated would be greater if all portions of the cylinder revolved at the same peripheral velocity. We can, however, by a few trials, determine what would be the amount of heat liberated for any given case if every point of the cylinder revolved at the same peripheral velocity. We will make this determination for one case; that with no field when the rise in temperature is 100° Cent.

For this case the amount of heat liberated per sq. inch per degree rise in temperature, for 3,000 ft. per min. is 0.0288 watts, and that liberated at 2,000 ft. is 0.0257 watts, a difference of 12 per cent. on the latter quantity. If we multiply 0.0288 by 123 the area of the curved surface, the total amount of heat liberated by this portion of the cylinder, per degree rise in temperature, is 3.54 watts, and similarly that liberated by the ends whose peripheral velocity is 2,000 ft. per min. is $0.257 \times 57 = 1.46$ watts, and the total heat liberated by the cylinder per degree rise in temperature is 5.00 watts. Dividing this quantity by 180 (the total area of the cylinder in sq. inches), we have for the heat radiated per sq. inch, per degree rise, 0.02782 watts.

This quantity, as was to be expected, is less than that actually found. Subtracting 0.02782 from 0.0288 we have 0.00098 watts. If we now increase the quantity 0.0288 by this amount, and the quantity 0.0257 by $\frac{100}{112}$ of the same amount, we ought to get two values very nearly correct for their respective speeds. The reason that the quantity 0.0257 is increased by $\frac{100}{112}$ of 0.00098 is that the amount liberated per degree rise in temperature is 12 per cent. greater at 3,000 ft. per min than at 2,000 ft. Using the figures found above, we will now apply them to the cylinder used, and we find that the amount of heat liberated at

3,000 ft. is 0.02978 watts per sq. in. per degree rise,
and at 2,000 “ “ 0.02668 “ “ “ “ “ “ “

The heat liberated from the curved surface=

$$0.02978 \times 123 = 3\,663 \text{ watts},$$

and from the ends of cylinder =

$$0.02668 \times 57 = 1.521 \text{ ohms},$$

or a total radiation from the cylinder of 5.184 watts per degree rise in temperature. And the radiation per square inch =

$$\frac{5.184}{180} = 0.0288,$$

the figure obtained by experiment

Hence the amount of heat liberated per degree rise in temperature from a surface, every portion of which is revolving at

3,000 ft. per min. is 0.02978 watts per sq. inch, and at
2,000 “ “ “ “ 0.02668 “ “ “ “

From this we see that under the most favorable conditions, the amount of heat liberated from a drum armature of a bipolar machine is 0.03 watts per sq. inch per degree rise in temperature. The increase at 3,000 ft. due to the above correction, is about 3.5 per cent.

It was our intention to find, if possible, the effect of the air space between the armature surface and the pole faces, but the great amount of time necessary for the determination prevented us from attempting it. The air space in the apparatus used was slightly more than $\frac{3}{32}$ of an inch. But it is probable that with an increased air space the effect of the field in preventing the radiation of heat would be less marked.

To sum up the results obtained we would state :

First—That an increase in the temperature of the armature causes an increased radiation of heat per degree rise in temperature, but that the rate of increase diminishes as the temperature increases.

Secondly—That the effect of the field is to prevent the radiation of heat. As the amount of the armature covered by the field is increased, the amount of heat radiated per degree rise in temperature becomes less. If not true for all speeds it is for the higher speeds at least. And it has been found to be true in *every* case where the rise in temperature was less than 50° Cent

Thirdly—That, as the peripheral velocity is increased, the amount of heat liberated per degree rise in temperature is increased but the rate of increase becomes less as we increase the peripheral velocity. The effect of speed is very marked and the above law was found to hold in every case.

Fourthly—That the highest radiation that can be obtained from a drum armature of the ordinary construction is about 0.03 watts per sq. in. per degree rise in temperature, when that rise in temperature is not over 100° Centigrade.

FIRE RISKS IN ELECTRIC INSULATION.*

By Frederick A. C. Perrine, D. Sc.

In spite of the best designed and best constructed system of wiring, accidental crosses may be occasioned by decay in the insulation or by mechanical occurrences which bring the two wires of the circuit into contact, cutting out the lamps or motors beyond the point in question and throwing the whole power of the machine into a much diminished resistance ; a great rush of current follows, and high heating is produced. Similar effects may be produced by crosses with the wires from another system in which the pressure is greater than that for which the wiring has been calculated.

Now, to guard against the evil effect of any such great accidental increase of current it is found advisable to sacrifice some one portion of the circuit in question and avoid the overheating of wires in the neighborhood of inflammable materials. For this purpose, at all the branches in any circuit, as well as at the point where the main wires enter the building or leave the dynamo, small porcelain boxes are placed containing terminal contacts for the wires and making a break in the circuits which enter and leave them ; in this gap between the contacts safety-fuses are introduced into the circuit. These safety-fuses are short pieces of wire made from some fusible alloy capable of melting at a temperature too low to set fire to any inflammable material on which it may fall while melted. Each fuse for any circuit is so proportioned that a definite amount of current will melt it, and in this manner a dangerous increase of current will automatically break the circuit and stop its flow.

Indeed, these little safety-fuses are the most important element for protection against fire in any electric installation, and the greatest care must be used in their location and proper maintenance. Provided the wireman in his haste has not substituted for them bits of copper or handy nails, the installation which is properly "fused" may be considered safe.

Any cause whatever of an increase of current above the normal will make these ever watchful little safeguards surrender their lives to the good of the remainder of the circuit. To be sure they are but mortal and have their almost human failings, and they may persistently burn out if placed in an overheated room ; they may not be quick enough to prevent some "sneak" current which follows a minute break in the insulation from setting fire to a board along which it finds its way to a neighboring gas pipe, but in the main they are true monitors and their warning should be heeded.

The "leaks," "crosses," and "sneak currents" spoken of above are all fertile causes of electrical fires, and are occasioned by defects in the insulation of the wires, which result in currents passing over resistances so great as to cause undue heating. Either by the "crosses" sending too great currents over the wires properly proportioned for their normal work or by the "leaks" sending currents of electricity over semi-conductives, such as damp woodwork, while the "sneak currents" are minute leaks which do not send a sufficiently great amount of current astray to increase the amount in the circuit sufficiently for blowing out safety fuses.

While the safety-fuses are the reliance when these accidents occur, yet in the normal and possible circuit the fuses are never called upon to perform their office. Insulation is the means of prevention of all these dangers ; insulation is the great need in a safe installation ; to the insulation we must look in installing our plant, and to the maintenance of the insulation we should devote our energies after the circuit is in operation.

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*From the Engineering Magazine, June, 1893.

As modern plumbing, gas fitting, and steam piping have revolted against concealed work, so the first method which has been successfully adopted for safely running wires in buildings and the method which is always used in factories is to run the wires in plain sight, and when porcelain or other non-absorbent insulators are used in supporting the wires to keep them away from contact with the surrounding woodwork or walls a very high degree of safety is obtained. There is the single objection to this method of construction in the power the electrified wires have of attracting and retaining floating particles of dust or lint, such as are often continually flying in the air of a manufacturing establishment. I have seen wires in such a place, which originally were hardly more than a quarter of an inch in diameter, attract cotton lint till they were more than an inch across, having the appearance of some hairy caterpillar creeping along the beams of the floor above, and I have known such dust-laden wires to carry a small fire in all directions till, before the original blaze could be extinguished, a half dozen other fires had been kindled and the building was doomed to destruction. Of course such an effect is only indirectly due to the electric installation, but, had the danger been appreciated and the wires kept free from such attracted particles, the small amount of labor necessary for the task would have saved thousands of dollars.

In an office building or a house, however, these unmasked wires interfere too much with the surrounding decorations or wall finishings, for, whenever the circuit is run, lights are needed in many places in the room, and the network necessary on the ceiling is apt to be very unsightly, especially as it seems impossible to run and keep the wires straight in all changes of temperature unless they are supported through their entire length, so that the expense of endeavoring to produce a decorative piece of work in such a manner amounts to as much as that necessary to do concealed work safely.

At the present time the likelihood of defective workmanship and mistakes is recognized much more fully, and it is not attempted to build an inflexible system into the walls of any building, but methods have been devised by which it is possible to withdraw defective wires and replace them without injury to the walls or woodwork of the building. Of course something must be fixed in the installation, but it is preferred at the present time to fix the conduit conveying the wires rather than the wires themselves or their insulation.

In old buildings where gas has already been installed and it is not deemed advisable to tear out the walls for a system of conduits there has been devised a neat molding having two grooves into which the wires may be laid, where they are then covered by a cap running lengthwise of the molding, and which, when completed, may be painted or made to harmonize in any other manner with the neighboring decorations.

While this molding system of conduits is extensively employed in old buildings and along wooden walls such as are found in our magnificent river and sound steamers, it is generally regarded with less favor than a system of round tubes made of some insulating material which are run under the plaster and terminate in junction boxes from which the wires may be pulled through the tubes. This is perhaps the safest and most satisfactory system for wiring any building, and this method combines the least possible interference with the decorations together with the greatest immunity from fear of fire. The tubes here spoken of are made in some cases of paper strips wrapped spirally around a mandrel, the tube so constructed being plunged into melted asphalt which is maintained at a high temperature; some are made of a low grade rubber, and others of a combination of a paper tube, with a rubber sheath, and the whole finally finished by a braided covering. The two latter tubes, being flexible, do not require any elbow pieces at the bends and present a smoother internal surface for drawing in the wires, but they possess the disadvantage that, on account of their flexibility, they are not so capable of resisting accidental blows or misdirected nails while the plant is being installed.

When such a complete system of tubing has been installed in a house and connected to the junction boxes, there is provided a continuous insulating and water-proof conduit passage for the wires from their original entrance into the house to the last light. The fuses, which must be as carefully attended to on this system as on any other, prevent any great rise in the temperature of the wires due to any external causes; while the tubes themselves offer no path for the leak through a defective insulation, and, in consequence, any system so installed may be considered to be perfectly safe against danger from a fire caused by the electric installation.

THE EDGE OF THE FUTURE.*

UNSOLVED PROBLEMS THAT EDISON IS STUDYING.

By E. J. Edwards.

Thomas A. Edison, when he was congratulated upon his forty-sixth birthday, declared that he did not measure his life by years, but by achievements or by campaigns; and he then confessed that he had planned ahead many campaigns, and that he looks forward to no period of rest, believing that for him, at least, the happiest life is a life of work. In speaking of his campaigns Mr. Edison said: "I do not regard myself as a pure scientist, as so many persons have insisted that I am. I do not search for the laws of nature, and have made no great discoveries of such laws. I do not study science as Newton and Kepler and Faraday and Henry studied it, simply for the purpose of learning truth. I am only a professional inventor. My studies and experiments have been conducted entirely with the object of inventing that which will have commercial utility. I suppose I might be called a scientific inventor, as distinguished from a mechanical inventor, although really there is no distinction."

When Mr. Edison was asked about his campaigns and those achievements by which he measured his life, he said that in the past there had been first the stock-ticker and the telephone, upon the latter of which he worked very hard. But he regarded the greatest of his achievements, in the early part of his career, as the invention of the phonograph. "That," said he, "was an invention pure and simple. No suggestion of it so far as I know, had ever been made; and it was a discovery made by accident, while experimenting upon another invention, that led to the development of the phonograph.

"My second campaign was that which resulted in the invention of the incandescent lamp. Of course an incandescent lamp had been suggested before. There had been abortive attempts to make them, even before I knew anything about telegraphing. The work which I did was to make an incandescent lamp which was commercially valuable, and the courts have recently sustained my claim to priority of invention of this lamp. I worked about three years upon that. Some of the experiments were very delicate and very difficult; some of them needed help which was very costly. That so far has been, I suppose, my chief achievement. It certainly was the first one which made me independent, and left me free to begin other campaigns without the necessity of calling for outside capital, or of finding my invention subjected to the mysteries of Wall street manipulation."

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* McClure's Magazine, June, 1893.

The hint contained in Mr. Edison's reference to Wall street, and the mysteries of financiering which prevail there, led naturally enough to a question as to Mr. Edison's future purpose with regard to capitalists, and he said:

"In my future campaigns I expect myself to control absolutely such inventions as I make. I am now fortunate enough to have capital of my own, and that I shall use in these campaigns. The most important of the campaigns I have in mind is one in which I have now been engaged for several years. I have long been satisfied that it was possible to invent an ore concentrator which would vastly simplify the prevailing methods of extracting iron from earth and rock, and which would do it so much cheaper than those processes as to command the market. Of course I refer to magnetic iron ore. Some of the New Jersey mountains contain practically inexhaustible stores of this magnetic ore, but it has been expensive to mine. I was able to secure mining options upon nearly all these properties, and then I began the campaign of developing an ore-concentrator which would make these deposits profitably available This iron is unlike any other iron ore. It takes four tons of the ore to produce one ton of pure iron, and yet I saw, some years ago, that if some method of extracting this ore could be devised, and the mines controlled, an enormously profitable business would be developed, and yet a cheaper iron ore—cheaper in its first cost—would be put upon the market. I worked very hard upon this problem, and in one sense successfully, for I have been able, by my methods, to extract this magnetic ore at comparatively small cost, and deliver from my mills pure iron bricklets Yet I have not been satisfied with the methods; and some months ago I decided to abandon the old methods, and to undertake to do this work by an entirely new system. I had some ten important details to master before I could get a perfect machine, and I have already mastered eight of them. Only two remain to be solved; and when this work is complete, I shall have, I think, a plant and mining privileges which will outrank the incandescent lamp as a commercial venture, certainly so far as I am myself concerned. Whatever the profits are, I shall myself control them, as I have taken no capitalist in with me in this scheme."

Mr. Edison was asked if he was willing to be more explicit respecting this invention, but he declined to be, further than to say: "When the machinery is done as I expect to develop it, it will be capable of handling twenty thousand tons of ore a day with two shifts of men, five in a shift. That is to say, ten workmen, working twenty hours a day in the aggregate, will be able to take this ore, crush it, reduce the iron to cement-like proportions, extract it from the rock and earth, and make it into bricklets of pure iron, and do it so cheaply that it will command the market for magnetic iron."

Mr. Edison, in speaking of this campaign, referred to it as though it was practically finished; and it was evident in the conversation that already his mind turns to a new campaign, which he will take up as soon as his iron-ore concentrator is complete and its work can be left to competent subordinates.

He was asked if he would be willing to say what he had in his mind for the next campaign, and he replied: "Well I think as soon as the ore concentrating business is developed and can take care of itself, I shall turn my attention to one of the greatest problems that I have ever thought of solving, and that is, the direct control of the energy which is stored up in coal, so that it may be employed without waste and at a very small margin of cost. Ninety per cent of the energy that exists in coal is now lost in converting it into power. It goes off in heat through the chimneys of boiler-rooms. You perceive it when you step into a room where there is a furnace and boiler; it is also greatly wasted in the development of the latent heat which is created by the change from water to steam. Now that is an awful waste, and even a child can see that if this wastage can be saved, it will result in vastly cheapening the cost of everything which is manufactured by electric or steam power. In fact, it will vastly cheapen the cost of all the necessaries and luxuries of life, and I suppose the results would be of mightier influence upon civilization than the development of the steam-engine and electricity have been. It will, in fact, do away with steam-engines and boilers, and make the use of steam power as much of a tradition as the stage coach now is.

"It would enable an ocean steamship of twenty thousand horse-power to cross the ocean faster than any of the crack vessels now do, and require the burning of only two hundred and fifty tons of coal instead of three thousand, which are now required, so that, of course, the charges for freight and passenger fares would be greatly reduced. It would enormously lessen the cost of manufacturing and of traffic. It would develop the electric current directly from coal, so that the cost of steam engines and boilers would be eliminated. I have thought of this problem very much, and I have already my theory of the experiments, or some of them, which may be necessary to develop this direct use of all the power that is stored in coal. I can only say now, that the coal would be put into a receptacle, the agencies then applied which would develop its energy and save it all, and through this energy electric power of any degree desired could be furnished. Yes, it can be done; I am sure of that. Some of the details I have already mastered, I think; at least, I am sure that I know the way to go to work to master them. I believe that I shall make this my next campaign. It may be years before it is finished, and it may not be a very long time."

Mr. Edison looks farther ahead than this campaign, for he said: "I think it quite likely that I may try to develop a plan for marine signalling. I have the idea already pretty well formulated in my mind. I should use the well-known principle that water is a more perfect medium for carrying vibrations than air, and should develop instruments which may be carried upon sea-going vessels, by which they can transmit or receive, through an international code of signals, reports within a radius of say ten miles.

Mr. Edison believes that Chicago is to become the London of America early in the next century, while New York will be its Liverpool, and he is of opinion that very likely a ship canal may connect Chicago with tide water, so that it will itself become a great seaport.

Electrical Trade Association.—The leading electrical firms of Washington, D. C., have recently formed an association for establishing a more general and better understanding and unanimity among themselves, and for their mutual benefit. The association was organized last July and is known as the "Association of Electrical Dealers and Contractors." The officers for the ensuing year are: President, C W. Jordan; vice-president, J. W. Burkett; secretary, C. W. Messner; treasurer, John W. Calloway. The firms represented are Messrs. Jordan & McLeod, J. W. Burkett & Co., Royce & Marean, The Washington Construction Co. (Pardoe & Messner), The Bliss Eng. Co (Bliss & Lewis), John R. Calloway, D. H. Washburn, and J. H. Kueling. The association is in a flourishing condition and has already shown to its members that it is a valuable aid to electrical interests in Washington.

ROPE-POWER TRANSMISSION.*

BY JAMES M. DODGE.

Rope-power transmission is comparatively a development of recent times. Although ropes were used in isolated cases for this purpose many years ago, it may be said, so far as this country is concerned, that the last ten years have seen the adoption of rope-power transmissions become more general and the system take a a recognized place in the field of mechanical engineering.

There are two general systems in vogue, which may be designated as the "English" and the "American." The former employs one or more single ropes, whereas the latter uses one continuous rope and employs a tension carriage, operating on one of the turns of the rope, to insure a uniform amount of work being performed by each wrap around the wheels.

Wheels or sheaves, used in connection with the rope for the purpose of transmitting power, are made with V-shaped grooves in the rims, the most commonly accepted angle being 45°. These grooves are made sufficiently deep to prevent the rope bottoming, or resting upon the bottom of the groove, the object of this being to increase the resistance to slipping and enable a moderate weight on the tension carriage to give sufficient driving force.

Sheaves used in conjunction with manila rope are made in two ways, the older method being to cast the sheaves with sufficient width of face for the number of grooves desired and to roughly core the grooves, so as to lessen the amount of iron to be removed by the turning tool in finishing them. It is necessary to cast the wheels sufficiently heavy to resist the pressure of the turning tool, in order to have the finished wheels as round as possible. It is almost impossible, however, to avoid a small amount of spring between the arms, so that upon careful measurement the wheel is found to be polygonal. This is notably the case when the cut is heavy, it being necessary, in order to obtain a good result, to take a roughing cut, which releases the skin tension of the casting and permits it to take a modified shape, due to the internal strains ever present in cast-iron wheels designed to have the outer surface removed from them by turning. Then a second cut is taken, and finally a finishing cut is made with a tool ground to the exact shape of one of the finished grooves, this last cut, which is made more to true up the inequalities of the previous work, removing but very little metal. In the foundry work connected with the manufacture of these wheels, it is seldom that a wheel having two or more grooves in it is so perfect that upon turning, imperfections are not discovered. These, of course, if too numerous, render the condemnation of the casting necessary. If, however, the sand holes, or blow holes, in the turned surface of the sheave are not too large, they are filled with babbitt metal, and the sheaves are put in use. The amount of metal turned from castings for rope sheaves is astonishingly large; for instance, in the case of a five-groove sheave of forty-eight inches diameter, for one and one-eighth inch rope, the rough weight before turning was 698 pounds, and after finishing the weight was 567 pounds, showing that 131 pounds had been turned off the original casting. This proportion would, of course, vary somewhat, dependent upon the care taken in the foundry, but at the same time it is always greater than would be supposed.

The second and newer method of manufacturing sheaves is that practised by the "Link-belt" companies and differs from the already described method in two very important features. In the first place, the sheaves are not turned after being cast, great care being taken in the proportioning of the hubs, arms and rims, so that the castings can be made of extreme lightness, but being devoid of internal strain are very strong. The grooves are cast on green sand cores, a three-part flask being used. By this we mean the flask has a cope and a drag, as is common in all foundry work, but between them is placed what is known as the "third part" or "cheek piece," which holds the sand destined to form the grooves in the finished wheel. It has been found in practice that it is possible to cast sheaves in this manner that are fully as accurate as turned ones, and with an average saving in weight of 17.2 per cent. This saving in weight, of course, effecting a corresponding economy in the power required to operate a rope drive furnished with them.

The second radical difference between the "Link-belt" sheaves and the solid turned sheaves, is that the manufacture of multiple grooved sheaves, or those having more than one groove, is effected by bolting together what are known as arm sections (which are really complete sheaves of one groove) and rim sections (which are simply grooved rims cast without arms or hubs). This plan makes it possible to vary the weight and strength of multiple groove sheaves by using a greater or less number of arm sections, dependent upon the size of the rope to be used and the various conditions of their employment. After the sheaves are "built-up," as it is termed, they are bored out, and to show the trifling difference in weight between the rough and finished sheaves, I would state that a forty-eight inch five-groove sheave for one and one-eighth inch rope weighs in the rough 433 pounds, and when finished 423 pounds, or 144 pounds less than the finished solid-turned sheave referred to previously.

So great is the care taken in the casting of "built-up" sheaves, that the only finishing required in the grooves is that of smoothing the casting by holding a block of emery in the groove while revolving at a speed of about 120 revolutions per minute, the finishing of each groove in this way not occupying more than three or four minutes.

An incidental advantage of the multiple groove "built-up" sheave is, that after a rope drive is erected and the necessity arises for the transmission of more power than that for which it was originally designed, additional ring sections may be added to the sheaves, and by splicing in an additional piece of rope, the desired increased transmitting capacity may be secured.

It is obvious that in the use of a single rope making a number of wraps around two wheels, it is essential that the diameters of the grooves at the pitch line, which is the arc of contact of the ropes, must be uniform in all of the grooves in any one sheave; otherwise there would be a tendency on the part of some of the wraps of the rope to travel faster than the others, which tendency must be counteracted by the slipping of the rope in some of the grooves, this, of course, resulting in a loss of power and also in the rapid wear of the rope. So important is this feature, that great care has to be taken in splicing the rope so that the diameter at the splice will be no larger than in the body of the rope. An increased diameter at the splice would, of course, make the splice travel around a larger circle on the sheave by its not being able to take as low a position in the V-shaped grooves. (*To be continued.*)

New Plant.—The Lynn and Boston Street Railway Company is constructing a power house in Lynn, Mass., which is to be a model of its kind as to construction and equipment. The capacity of the boilers is 2,500-horse power and the electric plant will consist of five 500-horse power Thomson-Houston power generators each driven by a 500-horse power engine.

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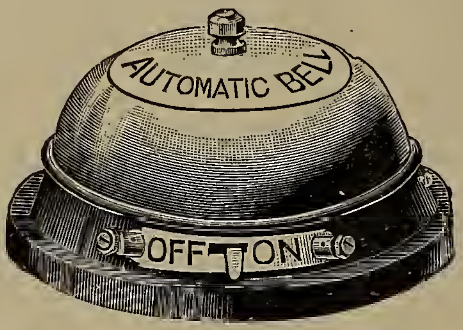
*A lecture delivered before the Franklin Institute, Philadelphia, Dec. 2, 1892.

AUTOMATIC SHORT CIRCUIT ALARM.

A new and ingenious automatic short circuit alarm bell, for gas lighting circuits, has been devised and promises to become popular because of its practicability, cheapness and reliability.

The features of the well-known "detatched relay," with local bell and battery, are incorporated in this bell, but it is free from the expense of the latter two devices. It not only gives an alarm when the short circuit occurs, but also interposes a resistance in the battery circuit, thereby preventing rapid deterioration of the battery.

The accompanying illustration gives a view of the bell. On the base are provided two binding posts, a switch, and an adjusting screw. When the switch is turned to *on* the apparatus is placed in circuit with the battery. The normal position of the bell is out of circuit. If the battery becomes short circuited to ground for a greater length of time than the adjusting screw is set for, the bell, which is placed at any point in the main gas lighting circuit, is thrown into action and rings until the trouble is attended to, when it is again out of circuit and the battery left in normal condition. The bell is placed in action by the main battery current, but the current through it when in action, is very small because of the resistance thrown in circuit. The adjusting screw on the right regulates the time the short circuit is to last before the bell rings. It acts beween ½ a second and 40 seconds. When they come from the factory they are usually set for 5 seconds.



BOGART'S SHORT CIRCUIT ALARM.

This novel device is made by Mr. A. L. Bogart, of 22 Union square, New York city.

Peckham Trucks.—The merits of the trucks of the Peckham Motor Truck & Wheel Company are being recognized by street railway managers all over the country. Recent orders for the standard trucks came from San Francisco, Toledo, Milwaukee, Detroit, Indianapolis, Rockford, Ill. The company is crowded with orders.

Hot Bearing Indicator.—An invention has been made by Mr. A. F. Esperson, of Tacoma, Wash., which is of use where machinery is employed. A small tube of mercury rests on the top of a bearing, and should the bearing become heated, the heat causes an expansion of the mercury in the tube which raises a brass plunger. The plunger, when raised completes an electric circuit and rings a bell attached to an annunciator in the engine room. The hot bearing is thus detected and located.

New Engineering Journal.—We are pleased to record the birth of a new engineering paper—*The Canadian Engineer*—a paper devoted to the interests of metal trades and mechanical science. It is a bright newsy paper containing well finished illustrations and descriptions of matter interesting to engineers. The paper is practical in its nature and of great value to the trade, as it contains an enormous budget of industrial notes. The Canadian Engineer Company, 62 Church street, Toronto, Canada and Fraser Building, Montreal, issues this paper monthly.

QUESTIONS AND ANSWERS.

Correspondence from practical men upon topics of interest relating to electricity and kindred subjects, will find a place in this department.

The publishers, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Our readers are invited to avail themselves of this department when desirous of seeking or imparting information on questions of general interest.

NEW CORPORATIONS.

New York, N. Y.—The Mason Electric Company of New York city, has been incorporated at Albany, to manufacture and deal in electrical goods in New York and Brooklyn; capital, $25,000; directors, Albert Van Derwerken, James H. Mason, Albert Van Derwerken, Jr., and Frank B. Johnson of Brooklyn.

Albany N. Y.—The East End Telephone Company, to construct and maintain a telephone line from East Hampton village to Sag Harbor and neighboring villages in Suffolk County; capital $500. Directors: David J. Gardiner, Jerry Huntting, Edward M. Osborn, of East Hampton, and others.

Salt Lake City, Utah.—The articles of incorporation of the Cañon Power and Water Company have been filed. The company is organized to accumulate water for motive power, and the principal place of business will be at Ogden. The capital stock is placed at $250,000, and the officers are: C. E. Mayne, president; E. R. Ridgeley, vice-president; O. J. Stillwell, secretary, and the Ogden State Bank, treasurer.

Hartford, Conn.—The Hartford Suburban Railway Company has been incorporated. The incorporators are William H. Bulkeley, Linus B. Plimpton, W. E. Goodwin, C. M. Henney, P. H. Quinn, David Henney and William R. Hurd.

It is stated that the Port Chester and Glenville Tramway Company is to be incorporated to build in the town of Greenwich.

The Enfield and Somers Tramway Company is to build from Thompsonville to Somers.

The Stonington Borough Street Railway Company is incorporated to build a short line in that borough.

The Mystic Street Railway Company is to be chartered to build from Mystic to Stonington.

The Windsor and Suffield Tramway Company is to build between those towns.

The West Side Street Railway Company of Stonington is to be chartered for a short line in that town.

Salt Lake City, Utah.—R. M Jones, has petitioned for a franchise permitting him to use the streets, alleys and highways of the city for poles, wires, pipes and conduits by which to transmit electricity into the city from Big Cottonwood cañon.

Telephone Injunction.—Arthur F. Stanley, J. J. Pembroke and John F. Bahr on Friday June 9, were enjoined by the United States Circuit Court for the Southern district of New York from manufacturing and selling telephone apparatus. The Bell Telephone Company obtained the injunction, its action being based on the Bell patent No. 186,787.

A Good Chance.—Any electrical manufacturing firm requiring the services of an electrician thoroughly posted and experienced in all that relates to the arc-lamp business will do well to consider No. 12 of Positions Wanted. on page xii.

PERSONAL.

Mr. Robert Watson, New York representative of the Elektron Manufacturing Co., Springfield, Mass., has resigned his position and will, about September 15 next, become associated with his brother, James A. Watson, patent attorney, Washington, D. C. Mr. Watson has the best wishes of a large circle of friends for his future prosperity in the new field.

Mr. H. W. Baker will succeed Mr. Watson as the Elektron Company's New York manager. Mr. Baker is a young man and was formerly the company's cashier in Springfield. The electrical fraternity in New York welcomes him.

Executed by Electricity.—Murderer Sapione Martella was executed by electricity in Clinton Prison, Donnemora, N. Y., on June 6. The current of 1,660 volts was passed through the body twice, the two contacts lasting two minutes and two seconds. After the first contact of one minute and seven seconds the man drew a deep breath, and it was necessary to apply the current a second time, for fifty five seconds. The voltage was gradually reduced from the maximum to 150 volts.

Correction.—In the article of Mr. A. G. Holcombe, printed in our last issue under the head of "The Telephone Patents," a slight error was made. On the thirteenth line from the top of the first column of page 366, the word "each" should have been "laches," making the last part of the sentence read, "making such a pronounced case of *laches* as to form an indelible element of prejudice."

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, June 10, 1893.

Mr Arthur W. Field, vice president and assistant manager of the Peckham Motor Truck and Wheel Company, Havemeyer Building, 26 Cortlandt street, city, is an active salesman He has had the necessary experience to make him a practical man in the line he is representing. From having been an artisan in the building of cars and street railway equipments, he graduated to the position of superintendent of manufacturing from which he became superintendent of an extensive street railway system in one of the large cities in New York State. Mr. Field has for some time been associated with Mr. Edgar Peckham and has recently been elected to the position of vice president and assistant manager. He looks after the sales of the Peckham trucks made by the Peckham Motor Truck and Wheel Company. The popularity of these trucks are at once apparent when it is shown that all the principal electric railroads in Brooklyn, New York, Jersey City and numerous other large cities use them exclusively.

Mr. William J. Hammer, consulting electrical engineer, has moved his offices to 1301 and 1302 Havemeyer Building, city. The rooms are handsomely fitted up.

Berg & Company, 136 Liberty street, city, formerly of 203 Broadway, are electrical and mechanical engineers, contractors for complete electric light and power plants, and make a specialty of Ward's economic lubricating reservoir.

The Edward P. Allis Company Reliance Works, Milwaukee, Wis., New York office, 26 Cortlandt street, city. Mr. F. A. Larkin, manager, has issued a confidential postal card, containing a partial list of purchasers and other information about the engines and machinery made by this company. Mr. T. M. Duncan is assistant to Mr Larkin.

Mr. J. L. Ludwig, Havemeyer Building, Cortlandt and Church streets, city, represents the Railway Equipment Company, of Chicago, the Altoona Manufacturing Company, of Altoona, Pa , and is agent for the Green engines. These engines are built especially for electric service and are economical for all power purposes. Mr. Ludwig handles electric railway material of all kinds and installs electric railroads.

Grant & Mitchell, 323 and 325 Van Buren street, Brooklyn, N. Y., manufacturers of wire solder, are meeting with great success in their business This solder is especially adapted for all electrical purposes and finds a ready market among manufacturers of dynamos and motors for soldering armature wires to the commutator. The firm makes a specialty of solder wire for telephone work. They have been experimenting for some time on their solder in order to meet the requirements of the various branches of the electrical industry, and have succeeded in producing a high grade article at reasonable figures.

Mr. Wm. A. Rosenbaum, the patent solicitor of the Times Building, city, has just returned from Chicago, where he has been prosecuting an important patent suit. He reports electrical matters brisk in the West, and the belief that the World's Fair will stimulate invention to a marked degree, which, of course means business for patent attornies as well as fortunes for inventors.

The General Electric Company has just issued a folder which is a work of art. It gives a brief history of the various branches of electric application, and it is profusely illustrated. The history of the Edison and Thomson-Houston Companies is briefly told in elegant illustrations. It is a very beautiful example of the printers art.

Mr. H. E. Vining has been appointed electrician of the Brooklyn Navy Yard.

Mr. John C. Dolph succeeds Mr. Bushnell as general eastern agent of the Eureka Tempered Copper Company, North East, Pa. Mr Dolph recently gave us a call. His office is at 126 Liberty street, city, where he carries a line of samples and a stock of goods.

Vanderbilt & Hopkins have removed from No. 120 to No. 126 Liberty street, city. They do a lumber and timber business and make a specialty of railroad ties.

D. G. Hawthorn and J. H. Longstreet compose the firm of Hawthorn & Company, 42 Dey street, city. They have been the New York representatives of the Shipman oil burning boilers and engines for some years and have installed hundreds of them for all kinds of power service. They are now putting in an 8 H. P. Shipman boiler and engine at Rhinebeck, N. Y., to run a generator for charging the storage batteries in John Jacop Astor's new yacht, which is driven by the power from a storage battery plant. W. T. H.

THE ELECTRIC FOUNTAINS AT THE WORLD'S FAIR.

The operation of the electric fountains at the World's Fair on the night of May 20 was not satisfactory, and the partial failure caused some comment. Knowing that the fault was not with the electric installation, Mr. E. J. Spencer, special agent for the General Electric Co., instituted an investigation with the object of placing the responsibility where it belonged. The trouble was with the hydraulic apparatus as will be seen from a letter from Director Burnham, of which the following is a copy.

May 24, 1893.

Mr. E. J. Spencer,
Special Agent General Electric Co.

Dear Sir: You have called my attention to the fact that many people have expressed disappointment with your electric fountains as played Saturday night last. You are aware that the hydraulic engineers are putting in a new connection, so that the electric fountains will have an independent pump pressure, instead of depending on the general system, now operating all fountains at the same time. Until this is done I do not expect more than the experimental work of last Saturday, nor do I wish you to try the brilliant effects depending on high pressure and quick shutting valves, as this would be dangerous to the pump machinery, until the separate connections, with additional safeguards, are ready. I am informed by the engineers that the special fittings are ordered, and that after they come it will take a week to complete the work. In the meantime please show set figures and lights on open exposition nights.

Very truly yours,
D. H. Burnham,
Director of Works.

TRADE NOTES.

Queen & Co., Incorporated, Philadelphia, have a new specialty in the "Acme" Portable Testing Set, described elsewhere in these columns, which can hardly fail to meet with great favor. It is remarkably compact and complete, all necessary parts including battery, being contained in one small and handsomely finished mahogany case that weighs only six pounds. The set is particularly well adapted to outside testing, but gives equally accurate results in Central Stations or factories, and on shipboard. It will be extensively handled by the trade as a standard article.

We are in receipt of a copy of the revised catalogue just issued by W. R. Ostrander & Company, 204 Fulton street, New York city. It contains illustrations, descriptions and price-lists of the great variety of apparatus carried in stock, embracing speaking tube and bell hangers' hardware, electrical supplies and pneumatic call bells. This is the ninth edition of their catalogue.

Whenever you have an inquiry about electrical appliances for medicinal use you will never go astray in commending those made by Jerome Kidder & Co. Every desirable feature of electrical methods of treatment are embraced in the varieties of instruments they manufacture. They have stood the test of time, of medical surveillance, of public observation, and to-day they lead all others in merit and sale.—*Pharmaceutical Record.*

OPEN CONTRACTS FOR ELECTRICAL BUSINESS.

OFFICIALLY ANNOUNCED.

Recorded for the benefit of subscribers to **ELECTRICAL AGE.**

All further available information can be obtained by our subscribers in applying by letter directed to Electrical Age, Dept. C, First Floor, World Building, New York. Reference must be made in each case of such application to the number in the following table and postage for answer must accompany the inquiry.

No.	Description of Work, or Contract.	Party to whom proposals must be directed.	Time up to which the proposals must be handed in, 1893.			Further information and specification obtainable through Electrical Age from	Amount, if any, to be deposited with bid in certified check.	Right to reject any bid received.	Special Remarks.
			Month	Day	Hour				
1*	To light the streets of a village (suburb).	Board of Trustees of the village, at their rooms in the Town Hall.	June	6	8 p.m.	The Village Engineer.	$2,000	Reserved.	
2*	Lighting the streets of the city with electric lights, for a term of five years, from July 1, 1894.	Common Council of the City.	Sept.	1	12 m.	Chairman of Committee.			
3*	500,000 El. Inc. all solid Lamps.	Company controling the patent.	July	1	12 m.	Secretary of Co.		Reserved.	
4	Construction and furnishing of an electric light plant, both arc and incandescent.	The president of the local Water and Electric Light Co., in the State of N. Y.							
5	Complete outfit for 150 incandescent and 30 arc lamps with guarantee as to power requirement.	The machine shop having contract for furnishing power and option on furnishing light plant.	July	1	6 p.m.				

The Electrical Age's Illustrated Record of Patents.

Issued June 6, 1893.

498,757. Insulated Conductor. Thomas F. Attix, Brooklyn, N. Y., assignor of one-third to Henry C. Hulbert, same place. Filed Dec. 1, 1892.

498,758. Lamp-Socket and Key-Holder Therefor. Henry P. Ball and Amandus Metzger, Schnectady, N. Y., Filed Aug. 3, 1892.

498,763. Electro-Motive Device. Romaine Callender, Brantford, Canada, assignor of two-thirds to Edward Hart and Edward L. Goold, same place. Filed July 14, 1892.

498,768. Electrolytic Apparatus. Thomas Craney, Bay City, Mich. Filed Mar. 25, 1892.

498,769. Method of Electrolyzing Salts. Thomas Craney, Bay City, Mich. Filed Aug. 10, 1892.

498,770. Electrolytic Apparatus. Thomas Craney, Bay City, Mich. Filed Aug. 10, 1892.

498,771. Electrolytic Cell. Thomas Craney, Bay City, Mich. Filed Oct. 10, 1892.

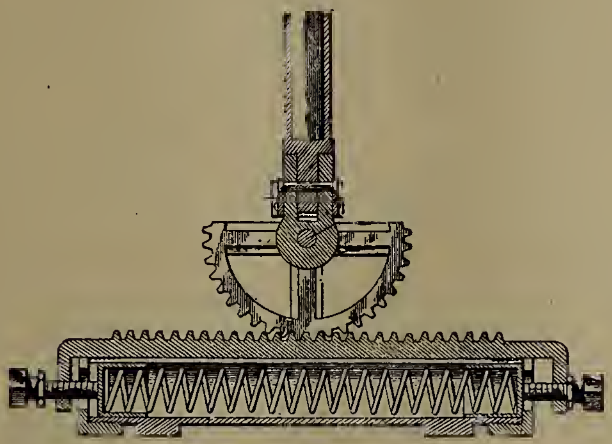
498,776. Clamp for Electric Conductors. Alex H. Englund, Chicago, Ill. Filed June 29, 1891.

PATENTS.—Continued.

498,799. Rheostat. Edward B. Knowles, Middletown, Conn., assignor to the Schuyler Electric Company, of Conneticut. Filed Jan. 9, 1893.

498,808. Telephone-Switchboard Annunciator. Frank R. McBerty, Downer's Grove, assignor to the Western Electric Company, Chicago, Ill. Filed Oct. 29, 1892.

498,852. Closed Conduit for Electric Railways. Charles J. Kintner, New York, N. Y., assignor of one-third to Gustav Stahl, Philadelphia, Pa. Filed June 27, 1892.



498,932—TROLLEY STAND.

498,865. Railway-Signal. Joseph B. Stewart, Haverstraw, and William G. Watson, Tappan, N. Y. Filed May 3, 1892.

498,869. Telephone Handle or Holder. Basil M. Wilkerson, New York, N. Y., assignor of one-half to Shipley Brashears, Washington, D. C. Filed April 14, 1891.

498,872. Receiver for Telemeter Systems. Charles W. Ayton, New York, N. Y. Filed June 7, 1892.

498,878. Electric Illuminating Apparatus. Edward A. Colby, Newark. N. J. Filed Feb. 15, 1893.

498,879. Method of Electric Illumination. Edward A. Colby, Newark, N. J. Filed Feb. 15, 1893.

498,901. Incandescent Electric Lamp. Alexander de Lodyguine, Paris, France. Filed Mar. 11, 1892.

498,906. Conduit Railway-Trolley. Michael H. Smith, Halifax, England. Filed Apr. 6, 1886. Patented in England Oct. 14, 1884.

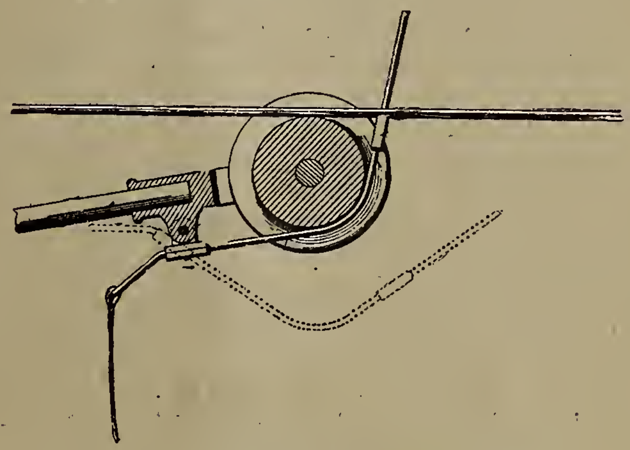
498,907. Electrical Condenser. William Stanley, Jr., and William B. Tobey, Pittsfield, Mass., assignors to the Stanley Laboratory Company, same place. Filed Jan. 9, 1893.

498,911. Copying Telegraphic Apparatus. Sylvester P. Dennison, Bellville, N. J., assignor to Herman Brossel, trustee, New York, N. Y. Filed Feb. 1, 1893.

498,915. Electrode for Electric-Arc Lamps. Salomon Heimann, New York, N. Y. Filed Oct. 24, 1892.

498,919. Telephone. Barton Pickering, Dayton, Ohio. Filed Oct. 4, 1880.

498,929. Electric Glow-Lamp. Edward A. Colby, Newark, N. J. Filed Feb. 15, 1893.



499,095—TROLLEY WIRE FINDER.

498,932. Trolley-Stand. James R. Griffiths, Chicago, Ill. Filed July 2, 1892.

498,933. Electric-Railway Trolley. James R. Griffiths, Chicago, Ill. Filed July 6, 1892.

498,969. Dynamo-Electric Machine. William S. F. Dillon, Chicago, Ill. Filed Nov. 21, 1892.

498,973. Method of and Apparatus for Perforating. Dexter M. Garnett, Evanston, and John H. Garnett, Chicago, Ill. Filed Feb. 14, 1893.

498,985. Mechanism for Transmitting Power from Car-Wheel Axles to Dynamos within the Cars. Morris Moskowitz and Samuel Young, Newark, N. J., as-

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HENRY A. CLARK, Treasurer and General Manager.
HERBERT H. EUSTIS, President and Electrician.

PATENTS—Continued.

signors of one-half to Leon D. Adler and Joseph Loewenberg, same place. Filed Dec. 6, 1892.

498,987. Non Interference Signal-Box. Charles E. Ongley, New York, N. Y., assignor by direct and mesne assignments, to the Ongley Electric Company, same place. Filed Jan. 19, 1891. Renewed Nov. 16, 1892.

498 988. Electric Signal and Protective System. Charles E. Ongley, New York, N. Y., assignor, by direct and mesne assignments, to the Ongley Electric Company, same place. Filed Jan. 21, 1891. Renewed Nov. 16, 1892.

499,003. Electrical Call-Box. Walter F. Banks, Milford, Conn. Filed Nov. 25, 1892.

499.062. Electric Time-Signal. Gerhard W. Van Vianen, Cologne, Germany. Filed Aug. 2, 1892.

499,090. Wire-Coupling. John Bodine, Pittsfield, Ill. Filed Nov. 29, 1892.

499,095. Trolley-Wire Finder. James Chase, Rochester, N. Y. Filed Jan. 23, 1893.

499,097. Electric Illuminating Apparatus. Edward A. Colby, Newark, N. J. Filed Feb. 15, 1893.

499,099. Electro-Dynamic Machine. Olof Dahl, Paterson, N. J., assignor to the Dahl Electric Company, of New Jersey. Original application filed Oct. 21, 1890, Divided and this application filed Apr. 22, 1893.

499,108. Telephone. Edward M. Harrison, Fort Smith, Ark. Filed May 31, 1892.

499,112 Overhead Electric Railway. John C. Henry, New York, N. Y. Filed Sept. 3, 1890.

499,115. Electric-Railway Trolley. George W. Hopper, Rochester, N. Y., assignor by direct and mesne assignments of three-fourths to John A. Stewart, James S. Baker, and Alfred Green, same place. Filed Aug. 10, 1892.

499,125. Electric Signal Apparatus and system. Jacob W. Lattig, Eastern, Pa. Filed April 12, 1893.

499,126. Electric Signaling Apparatus and System for Railways. Jacob W. Lattig, Easton, Pa. Filed Feb. 21, 1893.

499,143. Trolley-Wire Support. Carl Peterson, Brooklyn, N. Y. Filed Dec. 16, 1892.

496,167. Trolley-Wire Curve. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed February 2, 1893.

499,183. Friction-Clutch for Electric Motors. Olof Dahl, Paterson, N. J., assignor to the Dahl Electric Company of New Jersey. Filed Oct. 26, 1892.

499,189. Tower-Wagon. Joseph S. Hill, Lafayette, Ind. Filed Jan. 19, 1893.

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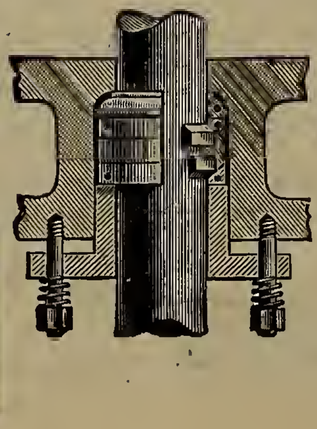

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ELECTRICAL AGE

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ELECTROLYSIS IN THE TREATMENT OF ORES.

Those of our readers who are interested in electrolysis in the treatment of ores will find an interesting article on the subject, on another page, from the pen of Mr. F. M. F. Cazin. Mr. Cazin contends that electrolysis may be economically and profitably employed in the treatment of the product from the different processes of extracting silver from its ores, and refers to a system of recent invention which accomplishes this object at one operation.

THE BLUE PRINT CASE.

It was thought by a good many people that the celebrated "blue print" case between the Westinghouse Company and the General Electric Company would be dropped, but it is quite evident that the Westinghouse Company never had any intention of letting go its hold on its rival. The finding of true bills by the Grand Jury at Pittsburg, a few days ago, against the officials of the General Electric Company and others, charged with conspiracy and larceny looks very much like business. At the trial no doubt many interesting things will be developed.

CAPITAL IN THE DEVELOPMENT OF INVENTIONS.

In an article by Mr. G. Emil Hesse, on the subject of developing electrical inventions, printed elsewhere in this issue, that gentleman calls attention to the difficulties inventors frequently encounter in their efforts to enlist capital to develop and introduce their inventions. There is always an abundance of available capital, but how to find it is where the difficulty lies, and many capitalists, on the other hand, are ready to undertake projects of this character but do not know how to reach inventors. If there could be some easy method devised of bringing the two parties together it would be of benefit both ways, and if any of our readers have any suggestions to make in this direction we would be glad to have them state their ideas for the benefit of all concerned.

THE CHICAGO-ST. LOUIS ELECTRIC ROAD.

It is stated on good authority that the General Electric Company has secured the contract to furnish the electrical equipment for the St. Louis–Chicago Electric Railway. It will be remembered that Dr. Wellington Adams, some time ago, aroused the indignation of electrical manufacturing companies in this country by proposing to ask Congress to admit foreign electrical equipment for the road, free of duty. It was stated at the time that there were concerns in this country as capable as any foreign establishment to manufacture the equipment for this unparalleled enterprise, notwithstanding Dr. Adams's intimation to the contrary, and we are glad to see that an American concern has secured the contract. Now, if Dr. Adams will push his road to completion and prove to the world that he is in the enterprise to succeed, he will dispel from the minds of a great many people the notion that the road will never be completed, that is, according to the present plans.

PECKHAM'S IMPROVED TRUCK.

We illustrate herewith (Fig. 1) the improved truck put upon the market recently by the Peckham Motor Truck and Wheel Company, which has some novel features. In the trade it is known as the 6 A truck, and the improvements embodied in the cantilever extension side frame, shown in Fig. 2, are 1st, in the arrangement of the elliptic and spiral springs, which are so combined and arranged as to find an extra long spring base, and at the same time relieve the eilliptic springs from extra heavy burdens, which are borne by the auxiliary spiral springs; 2d, in the construction of this frame no bolts are used, except in the wheel pieces, hot rivets being used throughout. All danger of the bolts used in the wheel pieces becoming loose is obviated by providing them with split pins.

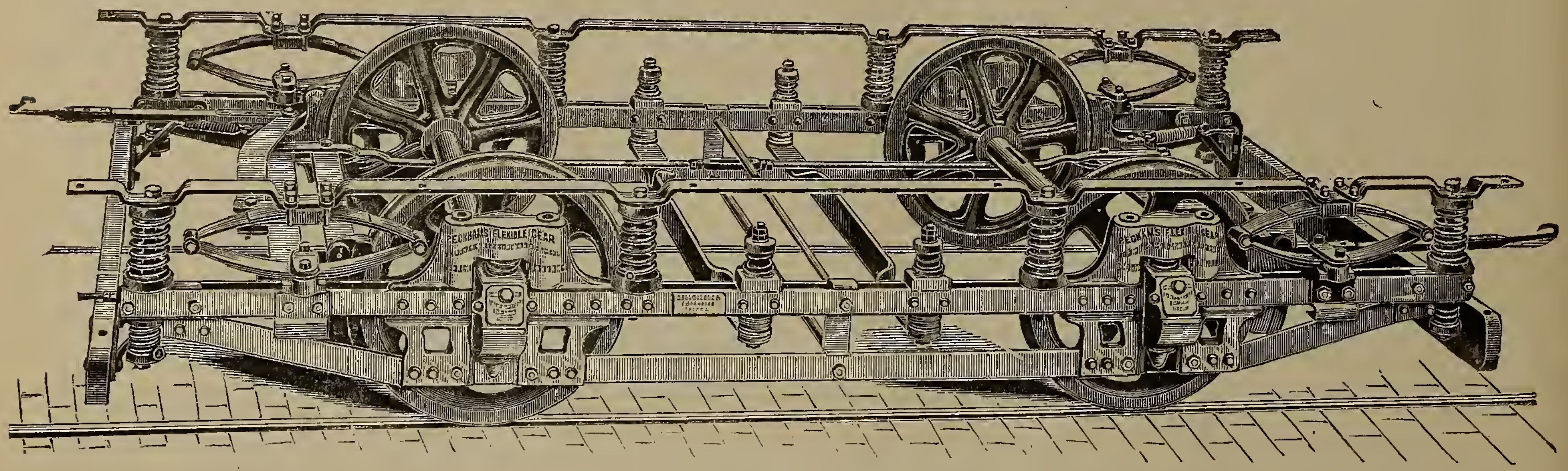


FIG. 1. PECKHAM'S 6A TRUCK.

The adoption of the ball-bearing, spiral spring, cushioned gear is another improvement which commends the truck to the favorable consideration of street railway managers. Figs. 3 and 4 show front and cross-sectional views of this gear.

In the construction of this gear a pocket is provided for the graduated spiral spring. The spring having a ball shaped seat which fits into a socket on the top of the journal box. A freedom of movement is given to the gear by this ball and socket joint and the strains on the side frames are thus relieved. The spiral springs of the gear cushion relieve the side frames and the motors suspended therefrom from shocks and concussion besides rendering the car much easier riding. The rail-joints also suffer less by the use of these springs. The greatest amount of strength obtainable is secured by this gear which is designed expressly for elliptic springs. When the wheels and axles are worn out they are readily taken out by removing a detachable wheel piece which is provided. By the removal of only eight bolts a complete set of wheels and axles can be taken out. These trucks are manufactured by the Peckham Motor Truck and Wheel Company, of New York, whose shops in Kingston, N. Y., are completely equipped with special machinery for their manufacture.

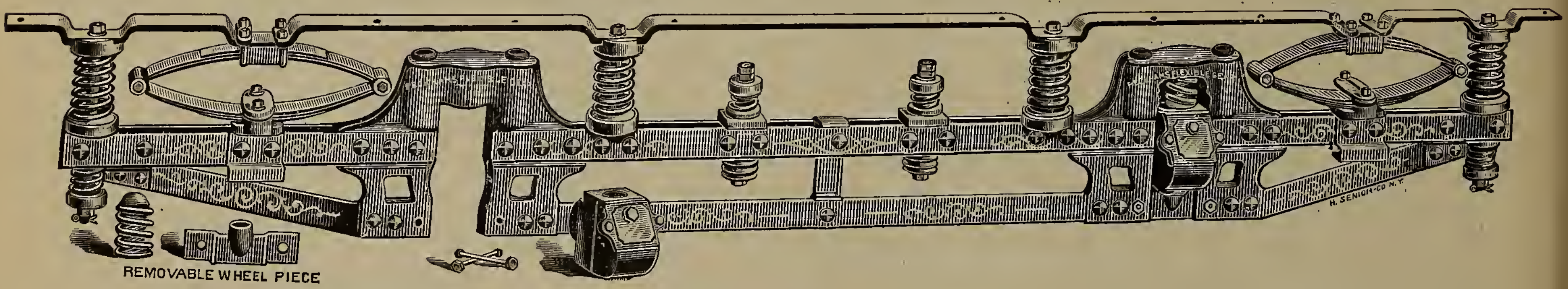


FIG. 2. CANTILEVER EXTENSION SIDE FRAME OF 6A TRUCK.

THE AMERICAN STREET RAILWAY ASSOCIATION.

We have received from Secretary W. J. Richardson, the following partial list of intending exhibitors who have applied for space at the Milwaukee convention of the American Street Railway Association next October:

Siemens & Halske, Chicago, Ill.; Fitzgerald Van Dorn Co., Lincoln, Neb.; Standard Railway Supply Co., Chicago, Ill.; Lamokin Car Works, Philadelphia; Mosher Electric Co., Chicago; Stanwood Manufacturing Co., Chicago; American Huoride Co., New York; Baltimore Car Wheel Co., Baltimore, Md.; Commercial Electric Co., Indianapolis, Ind.; New Process Raw Hide Co., Syracuse, N. Y.; Dorner & Dutton, Cleveland, Ohio; Sperry Electric Railway Co., New York; Short Electric Railway Co., Cleveland, O.; Wadhams' Oil and Grease Co., Milwaukee, Wis.; General Electric Co, New York; Peckham Motor Truck & Wheel Co., Kingston, N. Y.; Eureka Tempered Copper Co., North East, Pa.; Fulton Foundry Co., Cleveland, Ohio; The Steel Motor Co., Cleveland, Ohio; Automatic Car Brake Co., Grand Rapids, Mich.; National Electric Mfg. Co., Eau Claire, Wis.; Rochester Car Wheel Co, Rochester, N. Y.; E. F. DeWitt & Co., Lansingburgh, N. Y.

Picture of Goebel.—We have received from the Columbia Incandescent Lamp Co., of St Louis, Mo., with its compliments, a nicely framed large engraving of Henry Goebel, "the inventor of the incandescent lamp." The company deserves credit for its enterprise and persistence in maintaining its position, and president Rhotehamel is one of the most admired men in the country today.

THE POWER OF OCEAN CURRENTS.

A correspondent of *Electrical Plant and Electrical Industry*, London, gives the following interesting account of a scheme proposed some years ago to utilize ocean currents for the production of electricity :

"Some years ago, the writer was engaged in inspecting the coast-lines of the extreme north of the Irish channel, at the spot nearest the adjacent Scotch coast, and not far from the Giant's Causeway. A London engineer had long been surveying and studying the vicinity, with a view to throwing a strip of land across, and building power houses; and it was thought that by these means a monopoly of mechanical power in that part of Britain would be obtained. It was also part of the scheme to produce enough electricity to supply all the districts around.

"Nothing, however, came of the project, for lack of capital to make it better known. Yet it is unique, and from its daring character, worth description.

"In a direct line about 365 miles north-west of London, and about 126 miles north of Dublin, is the narrow sea passage between Ireland and Scotland, at the Mull of Cantyre; and it was in the immediate neighborhood that extensive surveys were made, with a view to throwing a strip of land across the narrow stream which divides the two countries. This land junction was to be, on an average, one hundred yards in width and depth, and a trifle over a dozen miles in length; the superficial extent of land, required to form the isthmus, being a little more than a square mile.

"It was proposed to obtain the power from the gulf stream, which, supplying the continuous current which flows from the North Sea into the Irish Sea, in columns of water estimated at many cubic miles daily, represents one of the greatest wastes of utilizable water-power in the world.

"The water-way between the headland of Cantyre, and Tor-Point, in Ireland, is twelve miles in width at low tide, and 474 feet deep at mid-current: but much shallower towards either shore. This was the position selected, as offering the best engineering facilities for the formation of an isthmus.

"The high bluffs of Cantyre, on the Scotch Coast, and the still higher land, comprising Mounts Clady, Escart, and Carnlea, near the Irish coast (from 900 to 1,200 feet high) offer facilities for obtaining the materials requisite to form the isthmus between the opposite shores.

"It was proposed that electricity should play an important part, even in the making of the junction. As soon as the earth works, which were ultimately to form part of the isthmus, had been thrown a little way out, it was intended that the first power-house should be built (or two power-houses, if a start were made on both sides) which would supply motive force for all the machinery, railways, etc., and be the means of furnishing current sufficient for as many arc lamps as would permit all-night working on the junction.

"Four or six power stations were to be alternately placed on the junction (two or three on either side), the site of each power-house to mark the position of a passage through the junction, for small boats or steamers. Thus, the connecting strip of territory would never interfere with shipping.

"These power-houses, capable of producing 5,000 H. P., each, were to furnish energy enough for all the needs of the manufacturing districts for many miles round, and it was thought that, by their means a system of electric-lighting, on a scale never before known, could be carried out. The coasts about there being rocky and dangerous, the currents always strong, and lighthouses rare, a considerable lessening of danger at night to the ships of the mercantile marine and navy would result from the better illumination of the coasts.

"The highway over the isthmus was to be provided with electric railroads—chiefly for goods transportation—and was also to be furnished with a solid carriage and foot-way, so that a person could walk from Scotland to Ireland in three hours.

"Besides the electrical and power results, the originator of the scheme made a great point of this: that 1,000,000 acres of submerged land could be reclaimed, and turned into valuable agricultural holdings. Physically, it would change the Irish Sea into a land-locked bay, lessened in depth by the cessation of the Atlantic flood from the north; and, it was thought, would thereby serve to aid the natural drainage of the adjacent coasts, and make the marsh-land of the west coast of England and east coast of Ireland capable of the highest forms of cultivation.

"The material for the undertaking was, as mentioned above, to be obtained in the nighborhood, and it was

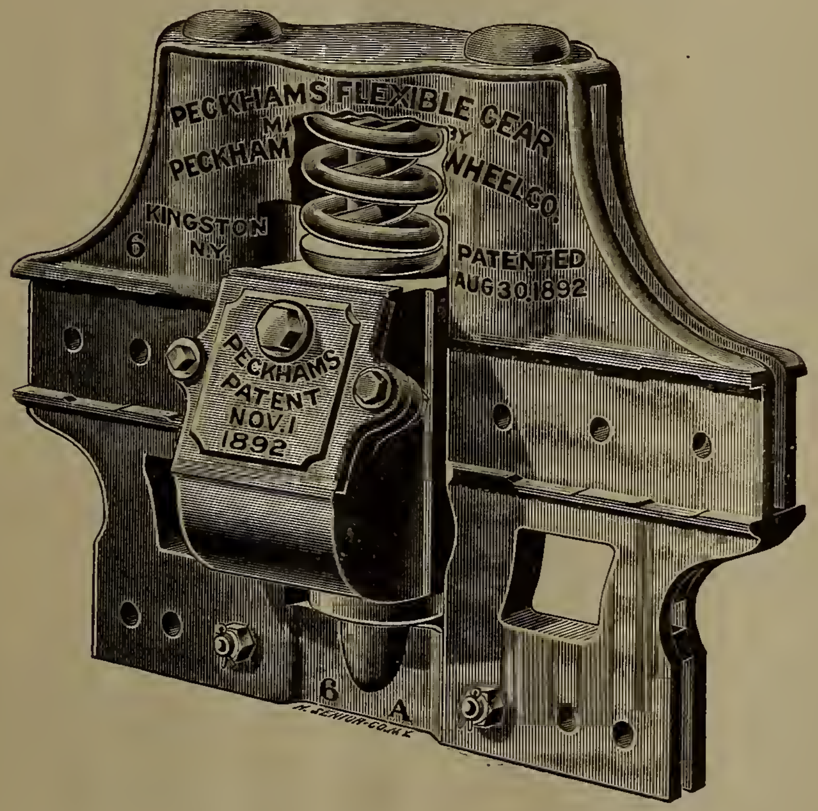


FIG. 3. GEAR OF 6A TRUCK.

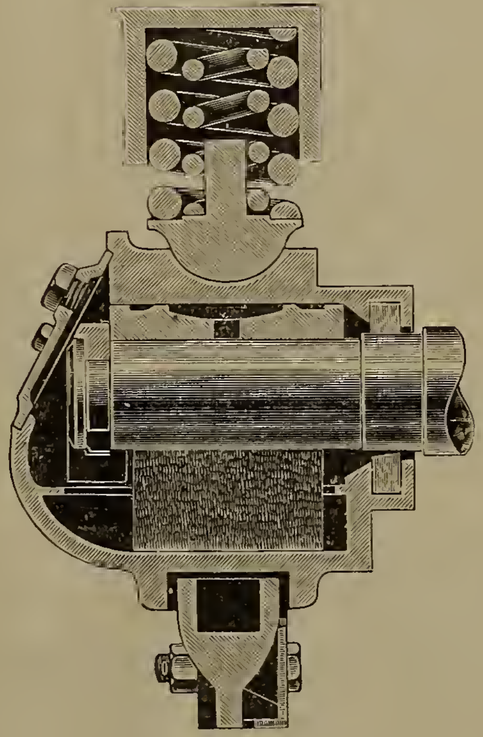


FIG. 4. SECTION OF GEAR.

proposed to make the scheme a State undertaking, and to utilize convict labor.

"It was estimated that the cost of forming the isthmus would be about two million pounds, and that it would take about 2½ years to complete the work.

"To maintain a passage for ships to and from the North Sea, and to the Irish Sea, it was proposed to enlarge the Crinan Canal, and to cut another through the Isthmus of Tarbert."

HYDRAULIC MACHINES.

As new machines and styles of construction work are being adopted, special apparatus to facilitate their production are placed on the market. Railroad work especially, calls for many of these special machines. The W. & S. Hydraulic Machinery Works, 204 to 210 East 43d street, New York city, manufactures several varieties of hydraulic jacks, punches, rail benders, etc., for this purpose.

A hydraulic machine used for punching bolt holes in the base of the slot or Z rails before or after being laid in position is illustrated by Fig. 1. Tool clips are placed on the front which drop into the cable slot and hold the tool up, while gauges on the sides determine the position of the hole and act as strippers when withdrawing the punch. Jaws from the rear adjust the work for the position of the hole. This machine saves much time and labor over the old methods.

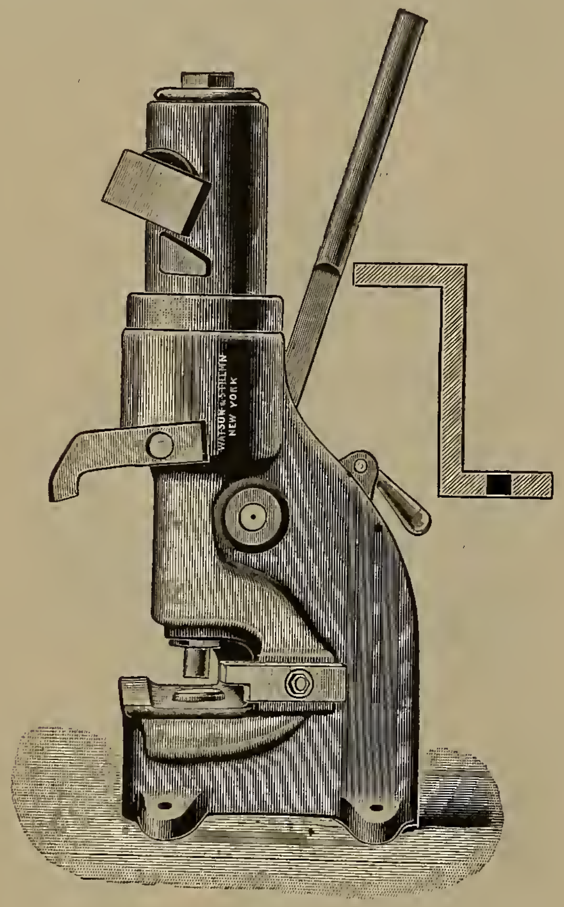


FIG. 1.

For the purpose of punching the spike slots in the base of heavy rails for regular railroad service, as is frequently desired on switches and curves, the hydraulic punch illustrated by Fig. 2, was designed. The punch may be brought down to the work without the labor of pumping. It is raised and lowered by means of the lower lever. The No 2 machine with 1½ inch jaw, weighing about 90 lbs., has sufficient power to punch the $\frac{11}{16} \times \frac{11}{16}$ slot in the side of the base of a 90 lb. steel rail. The machine is provided with guides for determining the depth and also to act as strippers.

A very important and desirable tool is shown in Fig. 3, which illustrates the hydraulic rail bender. The tool is placed over the rail and the ram brought up to its work on the rail head, when a few strokes will bend the rail to the desired curvature.

On a recent test in service, two men bent 40 30-ft. 90 lb. steel rails in one day, where previously 20 had been the best days' work of six men with the best of screw benders.

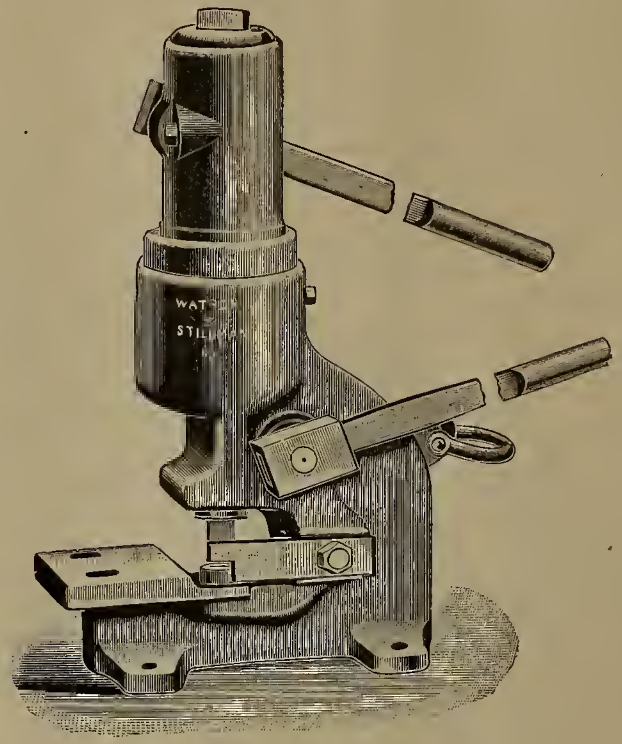


FIG. 2.

Strike.—A dispatch from Schnectady states that the pattern makers of the General Electric Works in that city went out on a strike, June 9, against the rules of the company in regard to the Saturday half holiday. Recently, the company changed the working hours of the men, commencing at 6:45 in the morning and working a few minutes more each forenoon and each afternoon, closing the works on Saturday at noon, thereby giving the Saturday half holiday, but making a full week's work. The men are dissatisfied with the change.

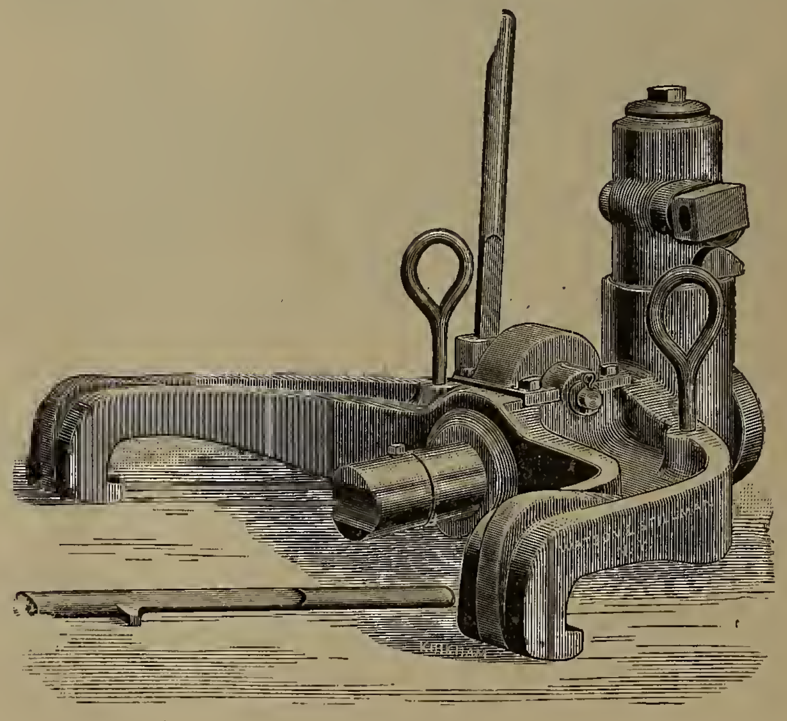


FIG. 3.

Electrical Execution.—J. L. Osmond, a convicted murderer, was put to death by electricity at Sing Sing Prison, New York, on June 12. The current was on 40 seconds and his death was instantaneous, it is stated by the attending physicians.

LECTURE BY MR. MASON.

Mr. James H. Mason gave a most delightful lecture Tuesday night, June 6, before the P. M. M. Fraternity connected with the Dutch Reformed Church on Carroll street and Seventh avenue, Brooklyn.

Dr. Farrar, the pastor, introduced the chairman, Mr. A. Van Derwerken, who in turn introduced Prof. Mason in most flattering terms.

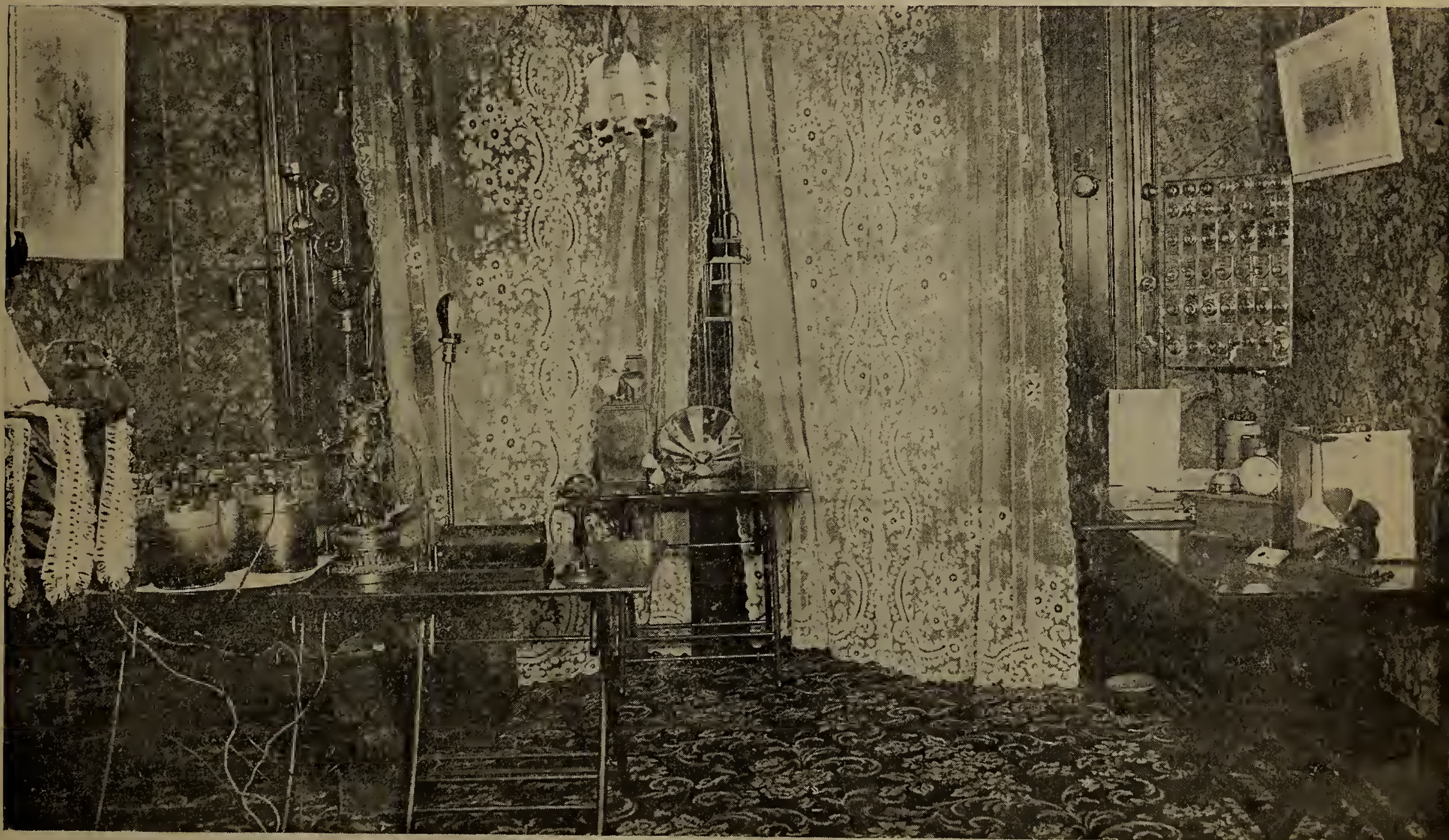
The large audience consisted of the leading society people of that aristocratic neighborhood, and gave Mr. Mason an enthusiastic welcome which goes to show that he is becoming very popular in Brooklyn. Long before the lecture the room was found too small to accommodate the constantly arriving visitors, so that the adjoining rooms had to be utilized to seat the listeners.

The lecturer was most explicit in his remarks which were delivered in a most fascinating manner. It is safe to say that Mr. Mason eclipsed all previous efforts.

The experiments, and there were many, went through in a most systematic manner, and the whole lecture-room was lighted and ventilated by means of the famous Mason battery system.

A vote of thanks was then in order and seconded, and was unanimously carried.

Mr. Mason used some of the finest apparatus ever introduced in a lecture.



VIEW OF APPARATUS USED BY MR. MASON IN HIS LECTURE BEFORE THE P. M. M. FRATERNITY, BROOKLYN.

POOR INVENTORS.

There are cases without number on record where prolific inventors have lived and died poor, while other individuals have become wealthy by the use of these inventions as a basis on which a large business has been built. The inventions get into their possession in various ways; sometimes fairly, but frequently otherwise, and the poor inventor very seldom indeed realizes a farthing from the results of his ingenuity and labor. His failure in many cases may be due to his own inactivity or business incapacity, but frequently it is the result of gullibility. Some shrewd capitalist comes along and by skillful manipulation the invention gets into his possession, and the inventor is left in the cold. It is indeed cold satisfaction to see the invention making somebody rich; but it is an old, old story.

The *Manufacturers Gazette* publishes an interesting article on this subject, and ascribes the ill success of inventors mainly to the ease with which they yield to false representations of designing men. "Their enthusiasm is so great," it says, "that it seems at times to completely drive out from their intellectual apartments every vestige of calm and impartial judgment. They have but one end in view, and anything that has even an apparent tendency to hasten the realization of this object is snatched at as quickly and unquestioningly as a drowning man clutches the floating straw, or is followed as hopefully as the lost wanderer pursues the treacherous light of the will-o'-the-wisp.

"That this gullibility exists even among the most successful and accomplished of our inventors today has recently received fresh confirmation. While this latest instance was not particularly disastrous, it was yet sufficently humiliating, we have no doubt, to have very keenly affected the finer emotions of the unfortunate persons upon whom the imposition was enacted. To be cheated by one's own countrymen is bad enough, but to be inveigled into sending good American money way across the ocean to Paris for a bogus diploma and a worthless piece of gilded brass is infinitely worse.

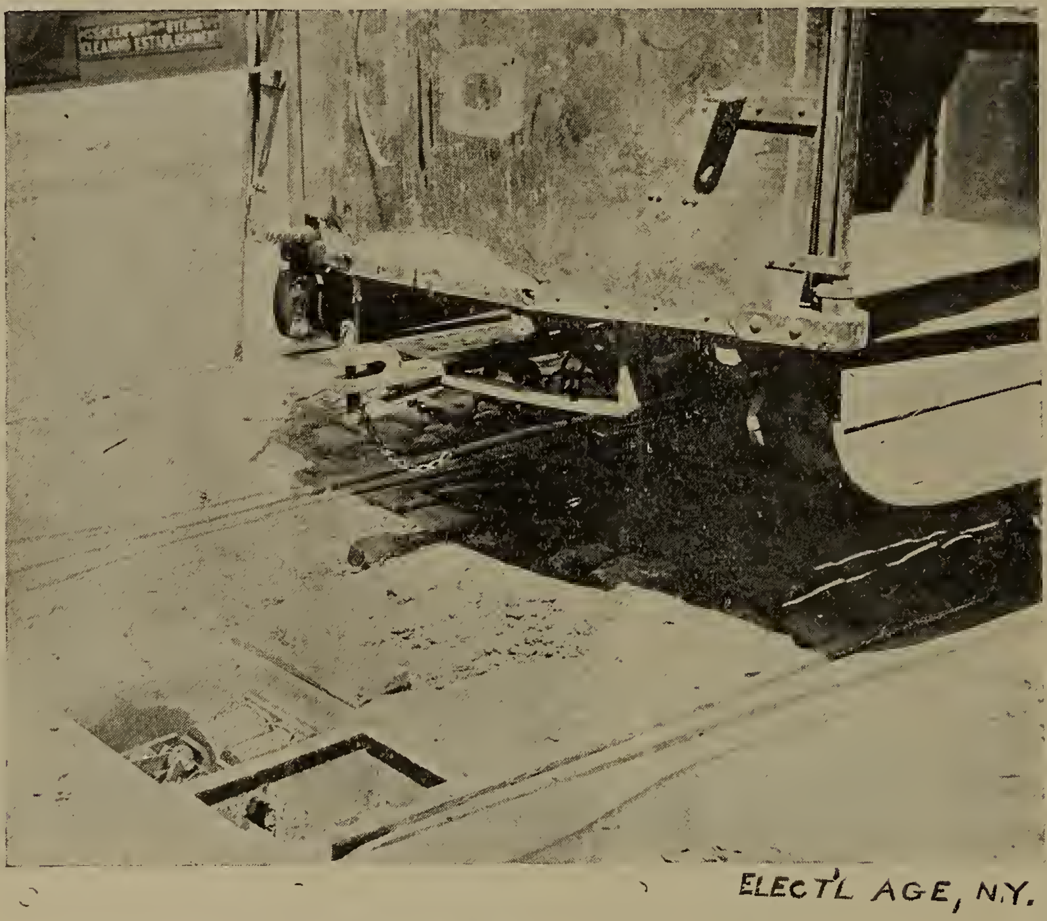
"The details of this swindling scheme, by which nearly 100 of our most prominent American inventors were mulcted of various sums of money, were unearthed by the Franklin Institute of Philadelphia. The scheme was ingeniously contrived and carried out. Our Patent Office Gazette was read with discrimination by a scoundrel in Paris, who sent a circular to a large proportion of those to whom patents had been granted. This communication came from an alleged 'Parisian Inventors' Academy,' and informed the recipient that he had had the very great distinction of having been elected 'a member of honor' of the institution, and that included in the election was the presentation of 'a first-class diploma' and 'a great gold medal,' both of which would be forwarded on receipt of $10.

"We refrain from adding to their mortification by publishing the names of some of those who bit readily at this bait, received their 'diplomas' and medals, and proudly hung them in their parlors or offices. These foreign testimonials of their distinction no longer occupy conspicuous places, and it is safe to say that a lesson has been learned well worth every cent that it cost. Too much credit cannot be given to the Franklin Institute for the admirable work it did in exposing the fraud."

AUTOMATIC ELECTRIC RAILROAD SWITCH.

On June 8, several representatives of electrical and other journals witnessed a practical test of the Fitch Automatic Electric Switch for electric railways, in Astoria, L. I. The switch is placed on the line of the Steinway railroad, a short distance above the ferry, where it has been working with very satisfactory results. It is very simple in construction and is operated by the driver of the motor car by simply turning the car current off or on in the usual way, at a certain point before reaching the switch.

The switch apparatus is contained in a cast iron box set in the ground between the rails. This box is divided into two compartments, in one of which being the magnets and the mechanism to revolve the shaft which runs through the partition into the other compartment. In the latter section is placed on the end of the shaft, a cam of peculiar shape which operates the tongue of the switch. The poles of the magnets have round faces, and the armature consists of a heavy semi-circular iron disc and is placed at the end of a radial arm set loosely on the shaft. When the magnets pull the armature up it also operates a rachet and pawl which revolves the shaft an eighth of a complete revolution. This action causes the cam to revolve a like distance, moving the tongue of the switch from one side to the other. When the magnets are not charged the armature and the radial arm are sufficiently heavy to drop down past the poles of the magnet, and when the magnets are charged the armature and its arm are drawn up by the magnetic force. It will thus be understood that every time the magnets are charged the shaft is revolved and the switch tongue moved from one side to the other by means of the cam.



FITCH AUTOMATIC SWITCH IN ACTUAL POSITION.

The cam consists of an iron sleeve fitted loosely on the shaft. A zigzag groove is cast on the inside of the sleeve and a pin on the shaft fits into this groove. The tongue of the switch is attached by a pin to the outside of the sleeve, and it is evident that when the shaft is revolved by the action of the magnets the cam sleeve slides along the shaft first one way then the other, by reason of the zig zag construction of the cam. As the sleeve moves it carries with it the tongue from one side to the other.

To operate the apparatus a very simple arrangement of connections is necessary. Just before reaching the switch one length of each of the two rails (30 feet) is insulated from the rest of the line. A ground wire is then connected in the usual manner with the insulated rails, and carried to magnets, thence back under ground to the main underground return. If, on approaching the switch the motor man sees the switch is turned the right way, he cuts off the trolley current from the car before he reaches the insulated section of rail, and makes the switch by the momentum of the car. After passing the insulated section he can turn on his current again. Should the switch be turned the wrong way the driver simply keeps the current on while passing over the insulated rails. This charges the switch magnets and the switch tongue is turned in the manner described above. While the car is on the insulated section, the switch can be operated just as well by turning the current off or on as the circumstances require.

The shaft of the switch apparatus is always turned one way but by reason of the zig zag shape of the cam the switch tongue moves alternately in reverse direction. Another great advantage this system offers is that no extra apparatus or handle on the car is necessary to operate the switch. The driver has simply to cut the current off or on, just as he does when he stops or starts his car; there are no extra switches on the car to operate and cause confusion.

The switch worked very well indeed and its extreme simplicity called forth many favorable comments. One quarter of the power required for the car is ample to operate the switch. The magnets are about 6 inches in diameter and 7 inches long and are wound with about 30 lbs. on No. 9 waterproof insulated wire. They exert a pull of about 20 or 25 lbs. on the armature. The section of the box containing the magnets is made water tight.

The accompanying illustration is made from a photograph of the switch made by our special artist. It shows the magnets, the semi-circular armature and other parts of the mechanism.

After the test the party was conducted by Mr. C. M. Fitch, the inventor, and General manager of the Fitch Excelsior Switch Co., to the Grand Union Hotel, New York, where an elegant dinner was served. Every one present voted the switch a success.

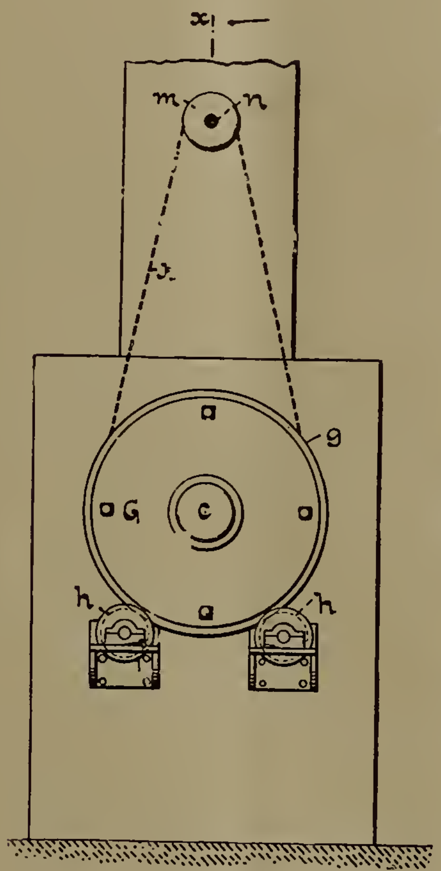


FIG. 1.

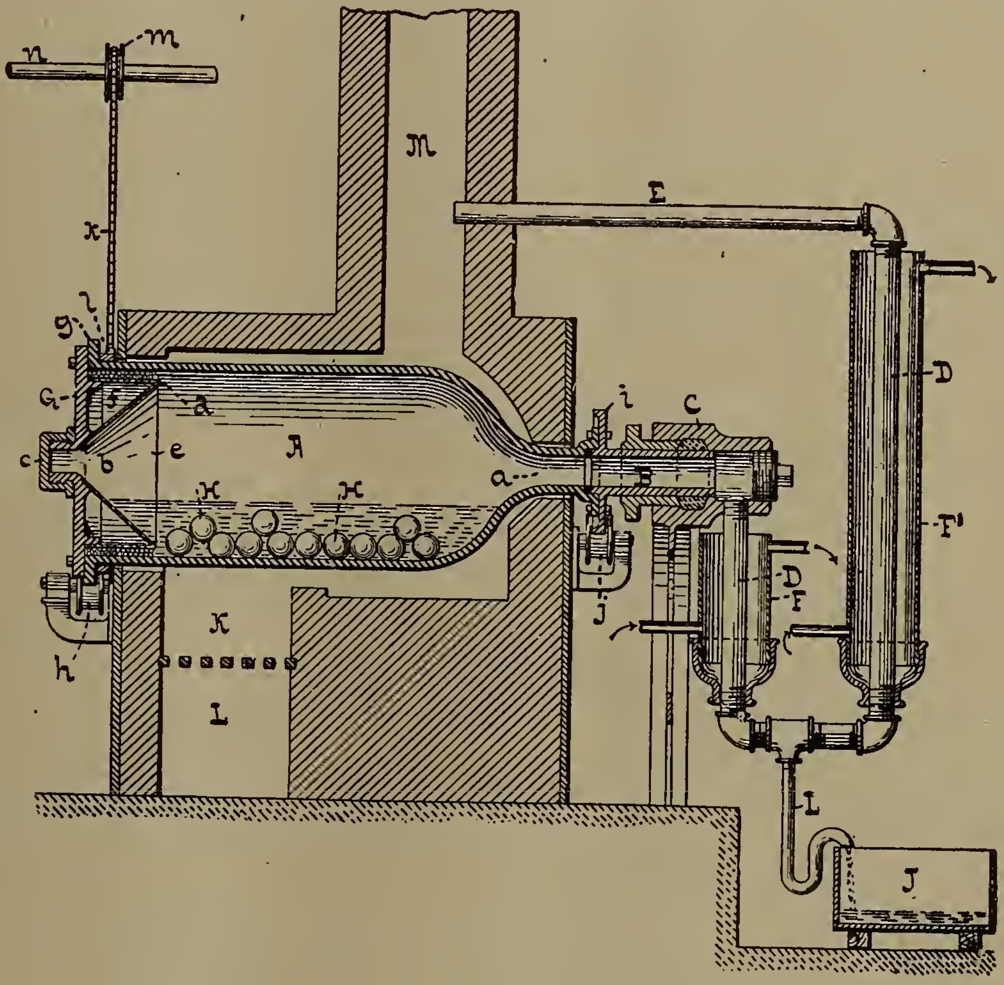


FIG. 2.

ELECTROLYSIS IN THE PRODUCTION OF SILVER.

By F. M. F. Cazin.

Whatever process may be applied in the first place for extracting from silver ores their valuable contents, whether it be amalgamation, wet extraction or smelting, electrolysis may be economically and profitably applied in the treatment of the product of the process so applied in the first place.

Electrolytic treatment of the product of amalgamation: When amalgamation produces fine doré bullion, the function of electrolysis is limited to the parting of gold and silver. Such electrolytic parting is at the present time a well-established practice and is known as the Moebius process. It has been fully described by me in the issue of March 14, 1891, of the now defunct *Financial and Mining Record*, and by George W. Maynard in the issue of May 9, of *The Engineering and Mining Journal*. Essentially the process is an amplification of the simple apparatus, with which the electrician has been and is measuring the dimension of electromotive force, by him called current, although he thus not only measures a dimension, but the electromotive force as such.* Aside from setting fewer passive cells in a series than the resistance to the potentials of current would permit and thus obtaining a crystalline cathion, Moebius

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*Since in the issue of August 15, 1885 of *The Engineering and Mining Journal* it was first announced by the writer that "The *absolute* caloric effect of combustion is *not* dependent on the quality (nature) of the oxygenated (or of other) but it *is* dependent on the quantity of oxygen (or other negative matter relatively) involved in combustion" the thermal effects being dependent also on contraction or expansion of components in the compounds it has been well demonstrated (compare amongst others, articles by the author on "Electro-Metallurgy" in *Electrical World*, April 30, and September 3, 1892.) that the electric energy spent in dissolving so much of a metallic compound, as measures the ampere, is inversely equivalent to the heat energy produced by ½ x Ox 0.00001 being consumed in oxygenation, or has modified the old process by introducing cathode sweepers, using therefor an obsolete clumsy mechanism.** The cost of parting doré bullion under this process under otherwise normal conditions, amounts to very nearly $\frac{1}{6}$ cent per ounce, not counting the patentee's royalties.

Actual practice at the works of the Pennsylvania Lead Company, as well as at those of the St. Louis Smelting and Refining Company, has demonstrated the practical impossibility of operating successfully with this process on doré bullion, that contains any appreciable percentage of copper. It is on that account that the product of Montana amalgamating mills can not be parted by the Moebius process without an intermediate manipulation for the purpose of separating the considerable percentage of copper from the alloy, such as Montana will ship to refiners.

It may be opportune to mention that the material here referred to is exclusively the product of amalgamating mills, such as the Lexington and Granite Mountain produce, and that the statement in no wise relates to the copper-mattes containing gold and silver, such as Montana furnaces produce. This matter, in which the fine metal represents only a fraction of one per cent., or of one per mille, is subjected to electrolytic copper-refining proper, the same as if it contained no fine metal, because such fine metal under the necessary precaution of keeping the electrolyte sour goes into the electrolytic mud and is then treated in the usual method of cupeling, etc.

The copper-silver-gold-alloy on the other hand, as the amalgamating mills produce it, is as unfit for this electrolytic copper refining process, as it is for the Moebius process.

The intermediate manipulation above referred to, as it is at present practised, for preparing the Montana doré-bullion for the Moebius process of electrolytic parting, consists in granulation, oxidation of copper and solution of copper in dilute sulphuric acid. This tedious and indeed costly process may be avoided, in part, by beginning the manipulation at an earlier stage of the evolution of the copper-silver-gold-alloy, that is at the stage when the product is yet in the state as amalgam, or before the mercury is distilled from the copper-silver-gold-alloy.

The accompanying illustration shows a mercury distilling apparatus, as designed and proposed by Moebius and intended to answer for the combined purposes of simultaneous distillation, disintegration and oxidation, the product being fit for wet copper extraction without special granulation and oxidation as a separate and additional action, leaving the fine metal in sufficient purity to be cast into annodes adapted to the electrolytic parting process. This apparatus was patented by Moebius, August 16, 1892.

Fig. 1 is a front view of the apparatus, and Fig. 2 shows a longitudinal central section of the same.

A, is a cast-iron retort with a flanged neck, *a*. The front end of the retort is closed by the plate, *G*, which has an aperture, *b*, in the centre. This aperture, *b*, can be closed hermetically by a screw cap, *c*. The plate or cover, *G*, is bolted to the flange, *g*, of the retort and has a cylindrical or funnel-shaped extension, *e*, which, by its outside cylindrical wall and the inner funnel-shaped wall incloses an air-space, intended for the double purpose of keeping the cover, *G*, protected from intense heat, and of forming a space, *a*, where packing can be inserted, thereby preventing the mercury fumes from escaping through the seams. Without such inside prolongation of the cover, *g*, condensation of mercury-fumes consequent to the direct contact of the cover, *G*, with the outside air would be considerable, and would result in extending the time required for the process. The retort *A*, is mounted in a furnace, *K*, in such manner as to provide for rotating motion being imparted to the retort and its cover, *G*, and its neck, *B*. Dimensions are shown approximately proportionate, the unit to be determined by the space to be occupied by the amalgam. Further details will best be stated in describing the modus operandi.

The amalgam and the iron balls, *H H*, are introduced into the retort by the opening, *b*. The balls act as disintegrators on the spongy alloy, that results from the evaporation of the mercury, receiving their rolling motion from the revolving of the retort. The disintegration is conditioned on the temperature of the retort being kept below the fusion point of silver = 1023°C. All parts shown beyond the neck, *B*, and its stuffing box, *C*, constitute the apparatus for condensing the mercury-fumes and no further specification thereof is required. When the retort no longer contains any mercury, the cap, *c*, is removed and an air-draft thereby created through the retort into the chimney, *M*, by the pipe, *E*. The rotating motion being continued the disintegrated particles of alloy are exposed to oxidation by such passing air, their surface being thereby constantly scoured, and the oxygenation of the copper can in consequence be carried out, until no metallic copper remains with the fine metal. The product becomes accessible by removing the cover, *G*, and after dissolving the Cu O. in diluted sulphuric acid the residue is ready to be cast into anodes for the parting process.

CATALOGUE.—We are in receipt of a copy of the new, handsomely illustrated catalogue of The General Incandescent Arc Light Company, First avenue and 34th street, New York city. It contains a large number of illustrations of the many styles of lamps made by the company and shows the lamps to be very fine, from an artistic point of view. Railway lamps, series lamps, chain lamps, bijou lamps and the regular standard lamps are illustrated and price lists given.

THE DETROIT ELECTRICAL WORKS.—On June 13, the extensive plant of the Detroit Electrical Works, Detroit, Mich., was sold at auction by order of the court, to satisfy claims against the company held by President Hugh McMillan. Mr. McMillan advanced large sums of money to carry on the business but the company failing to meet its notes for these advances made an assignment a short time ago. The works were sold for $100,000, and purchased by Mr. McMillan. It is stated that Eastern capital will likely be put into the business and the works started up again.

The subject of introducing electricity as motive power for canal boats on the canal in Augusta, Ga., is being discussed at that point.

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in other words, equivalent inversely to the effect of one-half atomic weight of oxygen x 0.00001 combining. The quantity of metal-cathion, that in all cases corresponds to the one-half atomic weight of negative matter is then

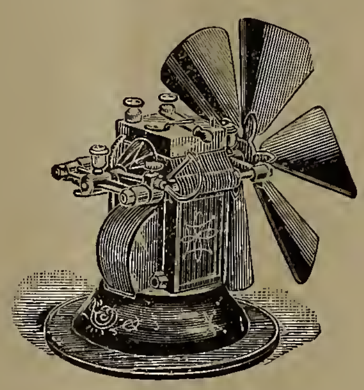
$$\text{as } Q = \frac{\text{atomic weight of positive matter x its coefficient}}{\text{2 x coefficient of negative matter}} \text{ x } 0.00001$$

and this quantity cannot possibly measure a dimension of electric energy only; it must measure such energy as a total. That this is so becomes evident from the other fact, that with 3016.05 gm-calories as the effect of combustion with one gm of oxygen, the value, 0.2406809 gm-calories, is equivalent also to the 1 watt, that is to 1/g kgm-m.

** Two equal eccentrics inclosed in one and the same frame, when keyed on two parallel but inversely revolving shafts, cause the point that halves the central distance between them, to reciprocate in a straight line, changing revolving motion into straight line reciprocating motion, in as rational a manner as crank and pitman modify straight line reciprocating motion into revolving motion. The one eccentric serving as force transmitter and the other as guide to movement, the latter's open crown is prolonged for the difference between the cathet, that marks their central position and the hypothenuse, that marks their extreme positions. In a vertical position as in the case of the cathode sweepers, this movement designed by the author obviates the necessity of guides of any kind for the sweeper rods and substitutes a true and regular motion for an irregular wobbling one, and produces a uniform effect on all parts of the cathodes.

THE H. N. H. FAN MOTOR.

This is the weather that gladdens the heart of the fan motor man, and large numbers of these small breeze makers are being installed all over the country. Our illustration shows a type of fan motor made by the H. N. H. Electric Company, 136 Liberty street, New York city. Both fields and armatures are of laminated construction. Sparking at the carbon brushes is obviated and the whole machine is finished up in a very fine manner A high efficiency is claimed and the motors are guaranteed. They are made in sizes of $\frac{1}{16}$ and $\frac{1}{8}$ horse power and are constructed for arc, incandescent, alternating and battery circuits.



H. N. H. FAN MOTOR.

W. R. OSTRANDER & COMPANY.

One of the oldest electrical supply houses is that of W. R. Ostrander & Company, of New York. Their goods are known and used all over the country, and the amount of business done in a year is enormous. The goods manufactured and dealt in by this firm consist of speaking tube hardware, oral, electric and pneumatic annunciators and bells, bell hangers' hardware, pneumatic call bells, burglar alarms, gas lighting apparatus, etc.

On the first of last May the firm moved its offices and warerooms to larger quarters, and it now occupies three floors of the building, No. 204 Fulton street, New York city. On the first floor are located spacious offices, and the salesroom. Here are found the goods of every description dealt in by the firm, systematically arranged for convenient access, and on the counters are placed show cases containing samples of many of the articles. On one side of the room hangs a large sample board of push buttons, electric bells, speaking-tube mouthpieces, annunciators, burglar alarms, and all the various other devices which can be advantageously displayed in this manner.

The stockroom and workshop are on the second floor. The workshop is maintained for the convenience of the firm's jobbing trade. Here the repairing is done, and a good sized force of men are constantly kept busy attending to the demands on this very important department of the business.

The third floor is used for storage purposes, where are found goods of all kinds in large quantities, finished and ready for shipment to the trade.

The size of each of the floors is twenty feet in length by seventy-five feet deep, and from the appearance of the vast quantities of goods, boxes, etc., stored away, it is evident that there is not any more room than is necessary to carry on the business conveniently.

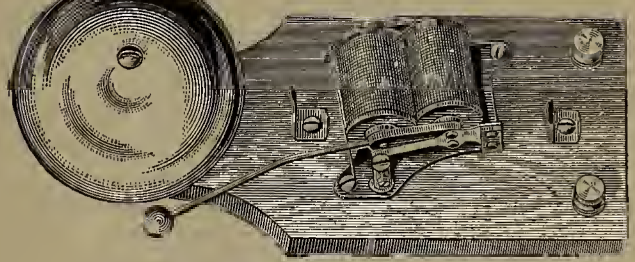
The company manufactures a very complete line of electric annunciators and burglar alarms. The apparatus of these classes contain the latest improvements, and are substantially made. They are perfectly reliable and being simple in design, are not liable to any derangement. All the supplies necessary for the installation of these devices are also made by this firm.

Some excellent electric bells are also made by this house, the Ostrander wood box bell, particularly, being a very popular style. The accompanying illustration shows the construction of this bell. It will be noticed that the bell hammer falls away from the magnets by gravity and not by tension of a spring as in other bells. This is an improvement inasmuch as it simplifies the construction of the bell, and the simpler any device is, the less liable it is to get out of order. The magnets of this bell are placed diagonally on the backboard, the purpose obviously being to throw the hammer out of perpendicular in order to secure its return to the backstop by gravity. The working parts of these bells are made on a soft Norway iron frame, and will not get out of order by the warping of the wood.

The firm's factory in Brooklyn, N. Y., is a very extensive and complete institution. It is located on De Kalb avenue, near Knickerbocker avenue, and while through frequent additions to the plant, it has grown to many times its original size, there is an abundance of room for further extensions; which are projected. On the main corner of the plot of ground owned by the firm is the new two-story office building, which was finished on the first of last May; this is the main office. Back of it is the speaking tube factory, a two-story building 20 x 50 in size. In the cellar of this building are located the engine and boiler rooms. The engine is a 30 H.P. Metropolitan, and the boiler a 40 H.P. Lehigh. The steam plant was put in entirely new three years ago, and it is stated that not five cents has been paid out since on account of repairs on the engine.

Adjoining the speaking tube factory is another building, three stories high, with an area of 20 x 50. This structure is devoted mainly to the manufacture of electrical apparatus of all kinds.

Part of the first floor, 16 x 30 in size, is built fire proof, with a solid stone foundation all around. This section is used for the storing of dies and expensive goods, and is entered by only one door and that is iron. The third floor of this building is devoted to grinding, polishing and nickel plating, and all the floors are constructed of cement twelve inches thich, thus rendering them fire proof.



OSTRANDER BELL.

Beside these three buildings there are three others. These are the general store house, stables and brass and bronze foundry. The store house is two stories high and the foundry one story. The stable has accommodations for four horses, and in the rear there is ample open space for trucks. The firm has its own wells on the place, but does not depend entirely upon them for its supply of water, using city water besides.

W. R. Ostrander & Co. enjoy a reputation for reliability in the trade that is unsurpassed, and to its policy of honest dealing is undoubtedly due the large measure of success it has met with in the past years of its existence.

The Metropolitan Traction Company proposes to increase the speed of the Broadway cable cars by replacing the 12-foot driving drums by 16-foot ones.

AN INTERVIEW WITH PROFESSOR ALEXANDER GRAHAM BELL. *

By Cleveland Moffett.

THE AIR SHIP OF THE NEAR FUTURE.

"I have not the shadow of a doubt"—these are his [Prof. Bell] own words, spoken to me quite recently at Washington—"that the problem of aerial navigation will be solved within ten years. That means an entire revolution in the world's methods of transportation and of making war. I am able to speak with more authority on this subject from the fact of being actively associated with Professor Langley of the Smithsonian Institution in his researches and experiments. I am not at liberty to speak in detail of these experiments, but will say that the calculations of scientific men in regard to the amount of power necessary to maintain an air-ship above the earth have been strangely erroneous; I may say ridiculously so. According to these, Nature would have given the birds and insects a muscular force vastly greater and superior in its qualities to that bestowed upon man. That seems unreasonable in the first place, when one reflects that man is at the head of creation, and we have found practically that such is not the case. The power required to lift and propel an air-ship is very much less than has been supposed; indeed, Professor Langley concludes that when the air-ship has once been lifted above the earth to the proper height, it will be possible to maintain it there with proportionately no greater effort than that expended by hawks and eagles in sailing about with extended wings. The air strata will do the bulk of the lifting, if a small propelling power is provided. Of course, a greater power will be necessary to lift the air-ship originally, and it may be some time before the art of managing an air-ship is discovered; but the final result, I am convinced, will allow men to sail about in the air as easily and as safely as the birds do. I predict that we will see the beginning of this modern miracle by the end of the nineteenth century.

"Of course the air-ship of the future will be constructed without any balloon attachment. The discovery of the balloon undoubtedly retarded the solution of the flying problem for over a hundred years. Ever since the Montgolfiers taught the world how to rise in the air by means of inflated gas-bags, the inventors working at the problem of aerial navigation have been thrown on the wrong track. Scientific men have been wasting their time trying to steer balloons, a thing which in the nature of the case is impossible to any great extent, inasmuch as balloons, being lighter than the resisting air, can never make headway against it. The fundamental principle of aerial navigation is that the air-ship must be heavier than the air. It is only of recent years that men capable of studying the problem seriously have accepted this as an axiom. Electricity in one form or another will undoubtedly be the motive power for air-ships, and every advance in electrical knowledge brings us one step nearer to the day when we shall fly. It would be perfectly possible, today, to direct a flying machine by means of pendant electric wires which would transmit the necessary current without increasing the load to be borne. Perhaps a feasible means of propelling such an air-ship would be by a kind of trolley system where the rod would hang down from the car to the stretched wire, instead of extending upward. This is an idea which I would recommend to inventors."

SEEING BY ELECTRICITY.

The mention of electricity brought up new possibilities for future discovery, some of them so amazing as to almost pass the bounds of credibility. He said:

"Morse taught the world years ago to write at a distance by electricity; the telephone enables us to talk at a distance by electricity; and now scientists are agreed that there is no theoretical reason why the well-known principles of light should not be applied in the same way that the principles of sound have been applied to the telephone, and thus allow us to see at a distance by electricity. It is some ten years since the scientific papers of the world were greatly exercised over a report that I had filed at the Smithsonian Institution a sealed packet supposed to contain a method of doing this very thing; that is, transmit the vision of persons and things from one point on the earth to another. As a matter of fact, there was no truth in the report, but it resulted in stirring up a dozen scientific men of eminence to come out with statements to the effect that they too had discovered various methods of seeing by electricity. That shows what I know to be the case, that men are working at this great problem in many laboratories, and I firmly believe it will be solved one day.

"Of course, while the principle of seeing by electricity at a distance is precisely that applied in the telephone, yet it will be very much more difficult to construct such an apparatus, owing to the immensely greater rapidity with which the vibrations of light takes place when compared with the vibrations of sound. It is merely a question, however, of finding a diaphragm which will be sufficiently sensitive to receive these vibrations and produce the corresponding electrical variations."

THOUGHT TRANSFERENCE BY ELECTRICITY.

Imagine two persons, one thousand or ten thousand miles apart, placed in communication electrically, in such a way that, without any spoken word, without sounding-board, key, or any bodily movement, the one receives instantly the thoughts of the other, and instantly sends back his own thoughts. The wife in New York knows what is passing in the brain of her husband in Paris. The husband has the same knowledge. What boundless possibilities, to be sure, this arrangement offers for business men, lovers, humorous writers, and the police authorities!

Preposterous as such an idea appears in its first conception, it certainly assumes an increasing plausibility when one listens to Professor Bell's reasoning.

"After all," he says, "what would there be in such a system more mysterious than in the processes of the mind reader? You substitute a wire and batteries for a strange-eyed man in a dress suit, that is all."

The logical basis of Professor Bell's scheme is clear, and its details quite beautiful in their simplicity, when you admit his major premise. That premise is that the human brain is merely a kind of electrical reservoir, and that thinking is nothing more than an electrical disturbance, like the aurora borealis or the sparks from a Holtz machine. The nerves are the wires leading from the central battery in the head. The reasonableness of this assumption is increased when one remembers that electricity may be made to act upon the nerves even in a lifeless body, so as to produce the same muscular contractions which are produced by the brain force, whatever that may be. We talk of animal magnetism. What if it were the same as any other kind of magnetism? If these two forces are identical in one respect, why may they not be so in all respects? So Professor Bell reasons, and granting that the human brain is merely a storehouse of electricity for our bodily needs, of electricity not essentially different from that which we know elsewhere, it must be possible to apply

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* Abstracts from McClures' Magazine, June, 1893.

the same electrical laws to the brain as to any other electric apparatus and to get similar results.

"Do you begin to see my idea?" said Prof. Bell, growing more and more enthusiastic as he proceeded. Then he gave a rapid outline of what might be a system of thinking by electricity.

Everyone knows, who knows anything about the subject, that an electric current passing inside of a coil of wire induces an electric current in that wire. Now, if the human brain be taken as a battery, then currents are constantly passing from it to various parts of the body, and the head may be considered in a state of constant electrical excitement, the intensity varying with the character of the thought processes. Now, suppose a coil of wire properly prepared in the shape of a helmet, and fitted about the head of one person, with wires attached and connected with a helmet similarly fitted upon the head of another person at any convenient distance. Every electric current in the one human battery must induce a current in the coil around the head, which current must be transmitted to the other coil. This other coil must then, by the reversed process, induce a current in the brain within helmet No. 2, and that person must receive some cerebral sensation. This cerebral sensation might be a thought, and probably would be, if it turns out to be true that brain force is identical with electricity. In that case, the thought of the one person would have produced a thought in the other person, and there is, if we go as far as this, every reason to believe that it would be the same thought. Thus the problem of thinking at a distance by electricity would be solved.

So much for a curious theory of what might be, if so and so were true, but Professor Bell has not stopped with theories, but has actually begun to put them to the the test. Not that he is over-sanguine as to the result, but he believes the experiment worth the making, and that seriously. He has actually had two helmets, such as those described, constructed, and has begun a series of experiments in his laboratory. Thus far, the results have been for the most part negative, but not so much so as to prevent him hoping that more perfect appliances may lead to something more conclusive. It is true that the thought in one brain has produced a sensation in the other, through the two helmets, but what the relation was between the thought and the sensation could not be determined.

ADVICE TO THOSE DESIRING TO BECOME ELECTRICIANS.

By T. D. H.

That portion of the youth of the present generation which is studiously inclined and ambitious to gain fame in the world turns its attention to electricity as naturally as a duck takes to water. There is no question that the electrical field offers greater opportunities for the development of every tendency in the nature of an ambition than any other in which young men can engage at the present time. The use of electricity, in one form or another, for the comfort and benefit of man, is increasing in a marvelous degree and the attention of thousands of electricians is constantly being given to still more extending the use of this wonderful force.

To the average lay mind everything and everybody in any way connected with any of the electrical industries is looked upon as possessing a charm which is irresistible. The subtle influence of the word "electricty" is overwhelming, and I am frequently called upon by young men who have reached that period of life when they begin to think of choosing a profession or an occupation, for advice as to the best method of acquiring a knowledge of electricity. To their credit it may be said that, as a rule, they exhibit a spirit of determination and independence which is assuring, but many of them make the mistake in supposing that it is an easy task to master the science of electricity. But the youthful mind looks only to the end and is apt to give the means to the end little real consideration.

It is not my purpose to discourage any young man from an ambition to become an electrician. Indeed, I heartily encourage all who are sincere in their desire to make their mark in the electrical field, and far be it from me to discourage any sincere efforts. There is a vast amount of room for all in the electrical field and the younger men should be given all the encouragement and help possible.

Of course to all who call on me for advice in the matter, I recommend, if it is possible for them to do so, to take a course of electrical engineering in some first-class college. Many of these educational institutions have added to their curriculum electrical engineering as one of the subjects of study, and to obtain a thorough knowledge, both theoretical and practical, of the science of electricity the best course to pursue is to attend one of these colleges for the purpose. The instruction is thorough and practical in every branch of the science, and when a young man is graduated from such an institution he is efficiently equipped for life's battle along this particular line.

Some young men are not so situated, or have not the means to attend college, and desire to know what is the next best course to pursue to acquire a thorough knowledge of electricity, outside of a college. Of course these want a practical education in, as well as a good theoretical knowledge of the business. To these young men I recommend an engagement with some electrical manufacturing concern where they can get the practical experience, and a systematic course of private study of technical works on electricity. A course of practical work such as the General Electric Company carries on is of great value. A very good theoretical knowledge can thus be obtained, if a young man is not able to attend a college; at the same time he will be getting the very best practical experience.

An electrician to be succesful now-a-days, must not only be a practical one, but he must also have a theoretical knowledge and understand all the laws involvolved in the science. There are electricians and electricians — one class, electricians in fact, and the other partly so or only in name.

The title is indiscriminately applied these days, and I would advise young men who desire to become electricians to be thorough in their efforts to merit the title. It is an honorable calling, and there is plenty of room for sincere and well deserving young men.

"THE INFRINGEMENT OF EDITORIAL RIGHTS."

In the issue of the *Phonogram* for April and May, 1893, the editor of that magazine refers to what he characterizes "gross editorial discourtesy" practiced towards the *Phonogram* by the Electrical Age. The circumstances connected with the affair, briefly told, are these: Some time ago the *Phonogram* published an illustrated article on the Edison Phonograph Works, in Orange, N. J. Thinking it would be of interest to our readers we asked that journal's permission to use the matter, and also asked for the loan of the cuts. Consent was promptly given on condition that proper credit be given the *Phonogram* for the use of the facts and illustrations. This was honestly agreed to by us, but by an unfortunate circumstance our part of the agreement was not carried out and the proper credit was not given. It was entirely unintentional, and we sincerely regret that it occurred. Errors will occur at inopportune times in the best of regulated establishments and this was one of them.

Having thus explained the occurrence and its attending circumstances we wish to call the attention of the *Phonogram* to a few facts and also some inaccuracies which appeared in its article first referred to.

It has always been the custom among reputable journals to treat one another with some consideration. In case of an error on the part of one, involving the rights of another, it is customary to ascertain privately if the wrong was intentional, before giving vent in public to the disturbed and suppressed emotions. Had our attention been called to the error at the time in the manner indicated we would gladly have acknowledged it, as we do now; but to open up a "broadside" without any warning or chance for explanation leaves open the question as to which party committed the "gross editorial discourtesy."

It is always fair to assume that errors of this nature among trade journals are not intentional, and common justice gives every one the right of being heard in his own defence before being condemned. But this privilege was, contrary to custom, denied us in this case, and the editor of the *Phonogram* endeavors to cast discredit upon our motives. The Electrical Age, however, has a reputation for integrity that cannot be so easily shaken.

The main inaccuracy of the article in question is the statement that "not only the cuts, but the *long article* indited by the editor of the *Phonogram* * * * the whole thing blazoned to the world as the handiwork of the Electrical Age" were published in the columns of the latter journal. If the editor of the *Phonogram* will take the time and trouble to compare the two articles he will find a vast difference between them as to length. The facts given by us were of course taken from the *Phonogram's* excellent story, but our article was very much shorter than the original. But this is an insignificant point compared with the main one. We simply wish, however, to point out that all of the charges were not accurately drawn. We trust that this explanation will be satisfactory to our contemporary, for whom we have always cherished the highest regard, and that he will entertain no ill-feelings towards us for the fancied injury.

AN ELECTRIC MINING PLANT AT BODIE, CAL.

The Standard Consolidated Mining Company has recently completed arrangements for a water-power and electric transmission plant to run its mill at Bodie, Cal., where it was believed that an important saving could be realized in this way. As wood costs about $10 per cord at the mill, and the fuel bills frequently exceeded $2,000 monthly, there was certainly an opportunity for improvement.

An excellent water-power was found at Green Creek, a mountain stream on the north slope of Castle Peak in the Sierra Nevadas, forming one of the chief sources of the East Walker River, and arrangements were made for a perpetual right to its use for power purposes, under very favorable conditions. This stream carries 500 miner's inches of water at its lowest stage, and runs six or eight times that amount of melting snow. An old ditch was cleared out and practically rebuilt for a length of nearly one mile, and a site selected for a power-house at 355 ft. vertically below the lower end of the ditch. The work of clearing the ditch, building dam, head-gate, waste weirs, flume and penstock, the power-house, and of laying and anchoring the pipe, was pushed during the months of August, September and October, and in November the water wheels were put in place, so that by December the water-power plant was completed and ready to run. A pole-line was constructed following a straight line 12½ miles in length over the mountains from the mill to the power-house, the copper wire was strung thereon, and 14 miles of telephone line was built between the Bodie office and the power-house, but at a distance from the power line in order to avoid induction and consequent bad service of the telephones. The motor foundations were also put in at the mill, and a motor room 26 by 18 ft. built, while the necessary counter-shafting and pulleys for making the connection between the motor and battery shaft were made ready to be put in place.

Lumber and other material from the old Bulwer-Standard mill was used in construction at Green Creek, thereby greatly reducing the cost. The power house 30 by 40 feet in size, was the former salt house, and the penstock, or pressure tank, was one of the water tanks at that mill, while the steel receiver at the lower end of the pipe was made at the mine from an unused steam-drum. The ditch is 4,558 ft. long and is connected with the penstock by a short piece of flume fitted with the usual screen, sand-box, waste-weir and flushing-off gate. The pipe leads into a steel receiver, 40 in. in diameter by 9 ft. 8 in. long, from which four taper pipes lead the water under pressure of 350 ft. vertical head on to as many 21-in. Pelton water wheels, each pipe being fitted with two nozzles, and each wheel capable of developing 62½ H. P. The wheels run at 865 revolutions, and the wheel shaft will be connected by a patent insulating coupling to the armature shaft of a Westinghouse 120-kilowatt alternating dynamo, generating current at 3,530 volts. A Doolittle governor is attached to the wheels, and a No. 2 Pelton motor has also been put in to run the exciter required for generating the initial current in the fields of the large machine.

The poles of the line are of round tamarack timber 21 feet long, 5 inches in diameter at the top, 25-feet poles being used through the town and where the ground required it. They are spaced 100 feet apart, and fitted each with a 4-inch by 6-inch by 4 feet cross-arm, boxed into the top of the pole, and fastened with one bolt and one lag screw; the wire is of No. 1 B. & S. gauge soft drawn bare copper, and is attached to standard double petticoat, deep grooved glass insulators carried on Klein ¾ inch by 8 inch iron pins. The wire used is of large section, but the distance of transmission is just at that midway point where the cost of converters about equals the difference in cost between a No. 1 and a No. 6 wire; hence it was considered better to use a higher potential and large wire and avoid the complicated and often troublesome converter. The loss of potential on the line is estimated at 15 per cent., and the current delivered to the motor will therefore be of 3,000 volts tension. The motor is of 120 H. P., and will be brought up to speed by a small motor of 3 to 4 H. P., which is built on the same bed-plate with the larger, and thrown out of circuit as soon as the latter is running at the proper speed, or in synchronism with the generator at the power-house. Two transformers, ratio 30 to 1, of a capacity of 100 incandescent lights each, will be used for lighting the mill and offices at Bodie.

The cost of this plant is given as follows: Water-power, including ditch, pipe, water-wheels, etc., $8,915; wire line 12.46 miles $10,474, or $840.63 per mile; motor-room, countershafts and pulleys at mill, $1,791; telephone line, 14 miles $1,099, or $78.52 per mile; sundry expenses, $305; total, $22,584. This does not include the dynamos and motors, which had not been put in at date of the report; the cost of the work was somewhat reduced by the use of material from the old mill, as stated.—*Engineering and Mining Journal.*

PERSONAL.

Mr. M. J. Sullivan formerly Editor of the *Street Railway Gazette*, Chicago, has received the appointment of World's Fair business representative of the *Electrical World*.

Mr. H. M. Haines, the railroad representative who has accompanied so many of the special trains carrying delegates to the various conventions of the National Electric Light Association, has accepted the office of treasurer of the American Traveler and Tourist Company, 849 Broadway, New York, a company which conducts a general railroad, steamship and steamboat business.

COMBUSTION.

A few facts in regard to the combustion of coal would probably be of interest to electrical men. As there is such an enormous loss of energy in burning coal it seems that great care should be taken to render the transformation of energy as efficient as possible under existing methods.

Coal must be distilled into gas before it can be properly burned and in order to do this, hot air must be introduced at a temperature which will not cool the gases below the igniting point. A large supply of hot air is needed whenever a fresh lot of coal is thrown in the furnace, as this, when first introduced generates a large amount of gas. If not enough air is admitted imperfect combustion will take place and therefore waste. A large air space in the grate bars must be preserved and arrangement made so that fresh supplies of hot air are introduced above the fire.

NEW CORPORATIONS.

Bangor, Pa.—The Easton and Bangor Street Railway Company, of North Hampton county, to run from Easton to Bangor, sixteen miles, capital $100,000, has been chartered.

Chicago, Ill.—The City Electrical Company, Chicago; capital stock, $100,000, incorporators, Martin Bergmann, Philip B. Schaffer, and Joseph Kastner.

Denver, Col.—The Fairmont Railway company has been incorporated with a capital stock of $10,000. It is to operate the motor line from the terminus of the East Colfax electric to Fairmount cemetery.

East Haven, Conn.—A resolution has been passed favorably on incorporating the East Haven and Morris Cove Railway Company.

Goshen, N. Y.—The Middletown-Goshen Traction Company has been incorporated for the purpose of constructing a street surface railroad in Middletown, about ten miles in length; capital $100,000; directors, B. F. Low and A. D. Seaman, of Middletown; E. G. Wrightman, S. W. Roberts, W. B. Rockwell, M. J. Wrightman, F. W. Bleckley and B. H. Throop, of Scranton, Penn., and Samuel Harris, of Cleveland, Ohio.

Hardford, Conn.—A resolution has been passed favorably on incorporating the Winchester Avenue Horse Railroad Company.

Huntington, Ct.—The resolution has been passed incorporating the Shelton Street Railway Company of Huntington.

Certificates Ready.—The certificate of membership of the American Institute of Electrical Engineers, engraved according to the design prepared by the Committee on Badge and Certificate, are now ready for distribution to those who have been transferred to the grade of member. The fee fixed by Council is $2.00 to cover the cost of engraving, printing and engrossing. Orders may be sent Secretary Ralph W. Pope and it is desirable that members should write their names either in full or with initials as they desire to have them appear upon the Certificate.

Installation Rules.—The Pacific Insurance Union has adopted the new rules prepared by the Underwriters' International Electric Association, for the installation of electric light and power. Mr. George P. Low, electrical inspector of the Pacific Insurance Union was largely instrumental in drawing up the rules.

Long Distance Telephone on the Pacific.—A telephone line is being erected between San Francisco and Los Angeles, Cal. The work is of the most substantial character, the wire—of copper—weighing 460 pounds to the mile. The poles weigh about 700 pounds each, and the cost of transporting them is said to constitute a large item in the construction account.

Receiver for a Seattle Street Railway.—The Rainier Electric Railway & Power Company and Seattle Consolidated Street Railway Company has gone into the hands of a receiver, through failure to dispose of its bonds. Its assets are much larger than its liabilities.

We are in receipt of a copy of the neatly illustrated catalogue issued by the Electric Heat Alarm Company of 113 Devonshire street, Boston, Mass. Within this little book is illustrated and described the heat and fire alarms systems brought out by the company, and which are meeting with great success in the trade. It describes the only automatic fire alarm system for hotels, calling attention in the office to the room in which the fire may be located. The exhibit of these devices at the World's Fair is attracting much attention. The company is equipping several buildings in Haverhill and making estimates for three more, several at Brockton, and one at Kingston, Mass.

DEVELOPING ELECTRICAL INVENTIONS.

By G. Emil Hesse.

The industry of the world, whether mechanical, electrical or chemical, is based on the invention of some inventor and may be very old or very young, as the case may be, but the great fact is nevertheless the same. The extraordinary developments, that have within very few years taken place in electricity has shown the world what an inventor can do when his genius is used in the right direction and backed up with a good technical education. There is hardly any one that requires such a thorough scientific training as our electrical engineer of today, and this fact is recognized more and more as time advances. It is a young industry, and, like the men that work in it, young, vigorous and pushing. Capital to the extent of many hundred millions has been invested and is continually going in for new and various applications of the science.

Nothing is too good or sacred here, and a thing that a year ago was considered perfect has today to give way for something still better. One would naturally think that it should be a very risky business to engage in, but this does not seem to be the case judging from the ease with which capital can be secured for it. This is a fact because every electrical concern keeps up with the times and does not stand still. Problems relating to measuring, transforming, transmitting, heating, etc., have been presented and quickly solved in many different ways and so far very satisfactory. Once, now and then, the inventor comes across a stubborn and intricate question, and it looks, as if all the skill and patience bestowed upon it was thrown away for nothing. They have to be solved nevertheless, it being too important to let rest, as every new departure means honor and increased business to those who are working on it.

To this category we have to class production of electricity direct; an economical way of storing it, which probably will be radically different from the present way; electric traction without any overhead construction and a more reliable lamp, with the same or higher efficiency than the present makes for out of door illumination. They are very hard to solve, some of these problems, and they require both capital and intelligent labor if anything good shall be accomplished. There are capitalists willing to invest money in just those things, but how shall the inventor know where they are? That is another problem and sometimes almost as hard to solve as a difficult electrical one. This obstacle ought to be done away with in some way. An engineer is very seldom also a business man; he has in fact no time to think about money matters and must consequently be associated with some one who understands that part of the business, which indeed is very essential, if eventually the problem is successfully solved.

It seems to me, nevertheless, that an institution of high rank, like the Franklin Institute, or the electrical press of the country, could fill that part, if a popular inclination was detected in that direction. These institutions come in contact with men of just those classes in question, and the great benefit that would be a result (if carried out) is too obvious to need any arguing. An inventor would then know exactly where to turn when he has anything new in the departments mentioned. I think in any case, that it would be to advantage to have the question ventilated in the electrical press, when undoubtedly several new points would come up, throwing further light on the subject.

ELECTRIC BUOYS AT CHICAGO.

A system of electric light buoys has been installed running from Chicago harbor to the steamboat pier at the World's Fair grounds and will be in operation soon. The work is being supervised by Commander John J. Brice, United States navy and inspector of the Ninth lighthouse district. The system will consist of thirteen buoys, half a mile apart, each one surmounted by an incandescent light of 100-candle power, and visible eight miles in clear weather. In times of heavy weather and fog no difficulty will be experienced by pilots in picking out the next buoy when he has reached the first one, and each succeeeding one in turn. The buoys will be painted red, and will be plainly visible in the daytime. They will be placed in the middle channel to the Fair and mark what is known as "Fairway." They will be located in the center of the channel, and boats will pass to starboard, leaving the buoys at least 100 yards to port. This precaution is taken to avoid all chance of fouling either the buoys or each other.

BOOKS.

Johnston's Electrical and Street Railway Directory is one of the most valuable works of the kind ever issued. The size of the book is a sure criterion of the marvelous development of electrical trades in the past few years, and the care with which it has been compiled makes it indispensable to every one in the trade. The book contains no less than 786 pages, and is gotten up in an excellent manner, both as regards the arrangement of the subjects and as a production of the printers' art. Its contents consist of lists of electrical associations, societies, etc.; telegraph companies, district telegraph companies, telephone companies' exchanges, licenses of the American Bell Telephone Company, central electric light stations, new electric light incorporations, prices paid for city lighting, electric light isolated plants, electric mining plants, street railways—electric, horse, etc., new street railway incorporations, general electrical trades, etc., electric trade incorporations; kindred interests; classified list of electric trades and kindred interests; alphabetical finding list.

The vast scope of the work will be apparent from a perusal of its contents as above indicated.

Mr. Newton Hall has charge of the directory and is now at work on the issue of 1894, which will be complete in evey point, up to date. Mr. Hall has taken great pains to insure correctness and convenience of arrangement in the former issues, and it is hardly necessary to say that the 1894 issue will be more valuable than any of its predecessors. An undertaking of this character entails a vast amount of labor and time, and the success that has attended the former issues is evidence that Mr. Hall's efforts have been fully appreciated by the trade.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, June 17, 1893.

The old board of directors of the Central and South American Telegraph Company and the Mexican Telegraph Company were re-elected at the meeting held in New York City, June 6.

Mr. G. Emil Hesse, the well known mechanical engineer, 35 Broadway, city, is now engaged in drawing the plans and specifications for a large electric railway plant. The undertaking is one of extraordinary magnitude, he having been engaged on it for several weeks past, and it will take as much more time to complete the work.

Mr. G. R. Shepard, electrician and engineer of the Friendship Club, 72nd street and Park avenue, city, is now adding to the electric light plant of the club, one 500-light General Electric Company's dynamo. The electric plant in this club is said to be one of, if not the finest in this city. Great pride is taken in the handsome surroundings of the engines and dynamos, so as to make it attractive to the ladies as well as to the gentlemen. The elaborate decoration of the front of the club building with incandescent lamps during the recent Columbian parade was the work of Mr. Shepard. It attracted universal attention, through the beauty of its design. Several thousand lamps were used in floral decorations and ornamental effects.

The Buckeye Electric Company reports a rousing good demand for "Buckeye Lamps."

The De Mott Motor and Battery Co., of 173 Greenwich street, city, has opened an exhibition room at 114 Liberty street, where its fan motors will be seen in constant operation. W. T. H.

FINANCIAL.

The American Bell Telephone Co., on June 14, declared the regular quarterly dividend of $3.00 and an extra dividend of $3.00 per share, payable July 15, next.

The Western Union Telegraph Company has declared a quarterly dividend of 1¼ per cent. on June 14, payable July 15, from partly estimated net revenue of $1,750,000 for the quarter ending June 30. Interest and sinking fund charges for the quarter are $243,335, leaving a balance of $1,506,665. The dividend will require $1,-

185,250, leaving a surplus of $321,415, which brings the total surplus up to $6,920,313. For the year ending June 30, this year partly estimated, the company makes the following showing: Increase in net earnings compared with previous years, $169,582; increase in net profits, $166,774; increase in dividends $342,464; decrease in surplus $155,690. The statement shows 6.63 per cent. earned on the stock, against 6.46 per cent. on the same amount of stock last year. Of the $6,920,313 surplus, $5,180,000 are represented by 51,800 shares of the company's stock held in its treasury. The surplus for the year $2,002,696, has been applied to the purchase and enlargement of the Phenix building at Chicago and to the construction of new lines.

QUEEN & CO.

Queen & Co., Incorporated, Philadelphia, report a large stock of "Magnetic Vane" Ammeters and Voltmeters which they can ship promptly and are pushing with great vigor. These instruments combine qualities highly essential for switchboard use and which render them specially valuable for isolated plants. A number have been supplied to exhibiting companies for installation at the World's Fair, and the makers have a handsome collection in their own display. The "Acme" Portable Testing Set described in detail last week, has met with favor wherever shown and is sure to become the standard instrument for general testing. Queen & Co., have already received orders for more than twenty sets. Circular No. 420 and 445, describing these specialties can be had for the asking.

THE KIDDER BATTERY.

The following is a copy of a letter received by the Jerome Kidder Mfg. Co., which explains itself:

Meadville, Pa., March 24, 1893.

Jerome Kidder Manufacturing Co.,
820 Broadway, New York.

Gentlemen: I purchased an improved Tip Battery Apparatus of E. H. Sargent & Co., Chicago, ("Kidder" make) with which I am much pleased. My friend, Dr. W. T. Baird, of Texas, said: "They *talk* about better coils than the "Kidder" in other instruments, *but they are not made*." Respectfully,

L. L. Doane, M D.

The Electrical Age's Illustrated Record of Patents.

Issued June 13, 1893.

499,253. Process of Magnetic Separation and Apparatus Therefore. Richard H. Sanders and Charles T. Thompson, Philadelphia, Pa. Filed Dec. 27, 1892.

499,254. Electric Hose-Coupling. Howard Sargent, Cambridge, Mass. Filed Feb. 21, 1893.

499,261. Burglar-Alarm System. Alfred Stromberg, Chicago, Ill. Filed Feb. 11, 1893.

499,270. Safety-Support for Trolley-Wires. Hiram K. Whitner, Chicago, Ill. Filed Feb. 6, 1893.

499,297. Electric Gas-Lighting Apparatus. Thomas W. Lane, Boston, Mass., and Charles E. Lee, Chicago, Ill., assignors to the Electric Gas-Lighting Co., Portland, Me. Filed Feb. 8, 1892.

499,298. Electric Gas-Lighting Apparatus. Thomas W. Lane, Boston, Mass., assignor to the Electric Gas-Lighting Co., Portland, Me. Filed Feb. 15, 1892.

499,305. Electric Bell, John L. Moore, New York, N. Y. Filed June 6, 1892.

499,313. Electrical Measuring-Instrument. Edward Weston, Newark, N. J. Filed Oct. 3, 1892.

499,321. System of Propelling Canal Boats by Electricity. Samuel W. Gear, Buffalo, assignor of one-half to John F. Alden, Rochester, N. Y. Filed Jan. 26, 1893.

499,350. Commutator for Dynamo-Electric Machine. Horace F. Parshall, Lynn, Mass., assignor to the General Electric Company, of New York. Filed Jan. 13, 1893.

499,363. Electric-Switch. James F. McElroy, Albany,

H. C. ADAMS, President. H. O. PHILLIPS, Treasurer. F. L. SMITH, Secretary.

PHILLIPS INSULATED WIRE CO.

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"O.K."
LINE AND HOUSE WIRES

All Sizes, 0000 to 18 B. & S.

Feeder Wire,
Line Wire.
House Wire.

39 & 41 Cortlandt Street,

NEW YORK.

PATENTS.—Continued.

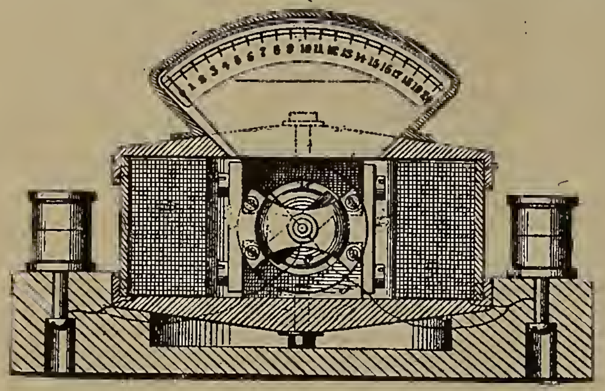
N. Y., assignor to the Consolidated Car-Heating Company, Wheeling, W. Va. Filed Nov. 16, 1892.

499,411. Electric Signaling Apparatus for Elevators. Chas. G. Armstrong, Chicago, Ill., assignor of one-half to Dankmar Adler, same place. Filed Jan. 23, 1893.

499,425. Strong-Current Protector. Charles D. Haskins, Brooklyn, N. Y., assignor to the Western Electric Company, Chicago, Ill. Filed Sept. 9, 1890.

499,428. Electric Hinge. William S. Hull, Sheffield, Ala. Filed Nov. 16, 1892.

499,446. Alternating-Current Generator. Wm. Stanley, Jr., and John F. Kelly, Pittsfield, Mass., assignor to the Stanley Laboratory Company, same place. Filed Jan. 9, 1893.



499,313.—ELECTRICAL MEASURING INSTRUMENT.

499,461. Overhead-Trolley-Wire Switch. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Feb. 2, 1893.

499,470. Shade-Holder for Electric Lamps. Charles Remhoff, Brooklyn, N. Y. Filed Feb. 13, 1891.

499,473. Electric Light. Gaston Sautter, Paris, France, assignor to Sautter, Harle & Co., same place. Filed Jan. 5, 1892. Patented in France Aug. 11, 1891.

499,485. Relay Fuse-Block. Gardner T. Voorhees, Boston, assignor to James E. Maynadier, Taunton, Mass. Filed Aug. 23, 1892.

499,518. Method of Electrically Welding Metals. Charles L. Coffin, Detroit, Mich. Filed Sept. 25, 1890.

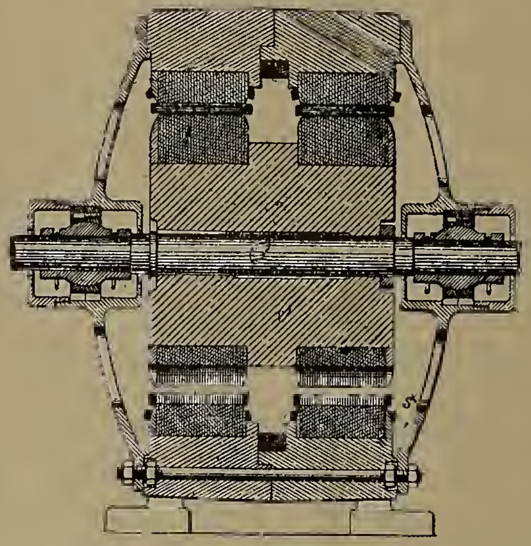
499,544. Regulator for Electric Machines. John C. Henry, Westfield, N. J. Filed Sept. 3, 1892.

499,596. Electric Igniting Device. William H. Russell and George E. Russell, Jersey City, N. J. Filed Mar. 9, 1893.

499,610. Recorder. John T. Todd, Newman, assignor, by direct and mesne assignments, to the Todd Applegate Company, Chicago, Ill. Filed May 24, 1892.

499,614. Multiple-Fuse Block. Gardner T. Voorhees, Boston, assignor to James E. Maynadier, Taunton, Mass. Filed Sept. 1, 1892.

499,633. Gearing for Electric-Railway Cars. John C. Henry, New York, N. Y. Filed Apr. 29, 1892.



499,446.—ALTERNATING CURRENT GENERATOR.

499,657. Method of and Apparatus for Electrically Welding Sheet Metal. Charles L. Coffin, Detroit, Mich. Filed Oct. 18, 1892.

499,664. Electric-Fuse Block. Thomas J. Fay, New York, N. Y., assignor to James L. Doolittle, Brunswick, Me. Filed Feb. 11, 1891. Renewed May 2, 1893.

499,676. Electric Arc Lamp. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed March 28, 1893.

499,681. Electro-Magnetic Blanket. Nils A. Renstrom, Omaha, Neb., assignor of one-half to James S. Stone, same place. Filed Apr. 15, 1893.

499,693. System of Wiring Multiple Switchboards. Charles H. Wilson, Chicago, Ill., assignor to the Western Electrical Company, of Illinois. Filed Oct. 8, 1888.

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☞ELECTRICAL AGE contains a weekly full record of all vacancies for employees in electrical and kindred metal business. (Compare page XII.)

ELECTRICAL AGE

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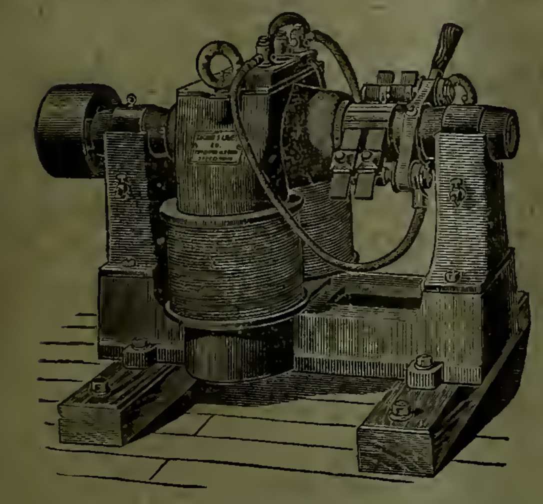

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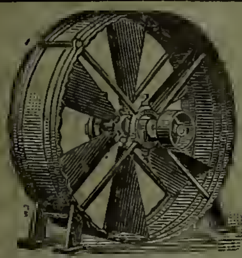

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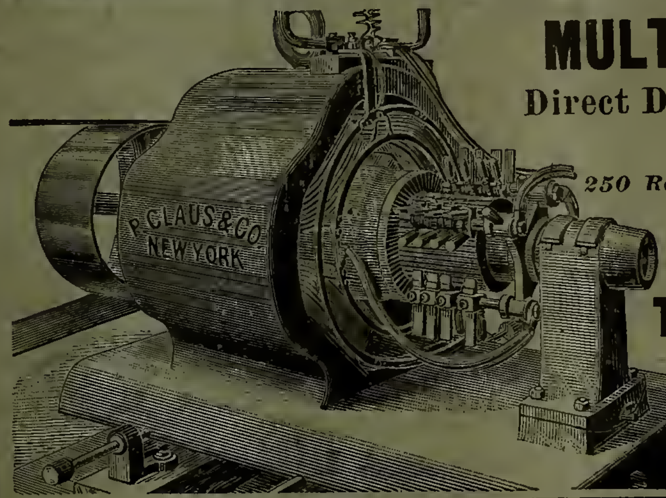

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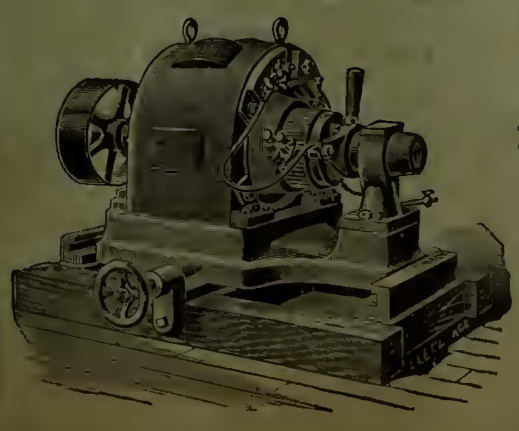

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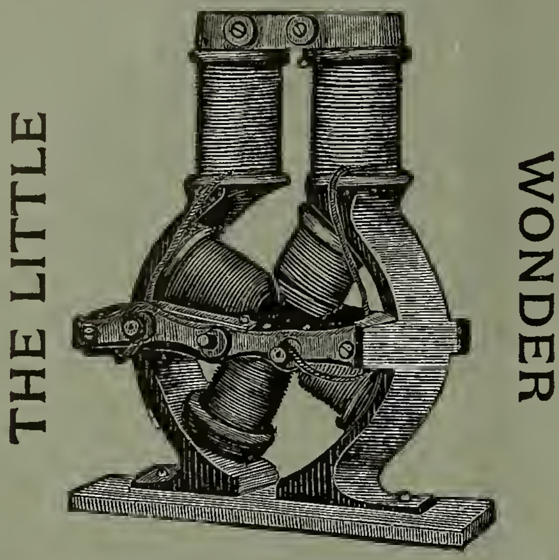

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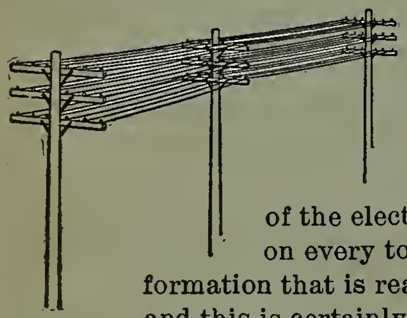

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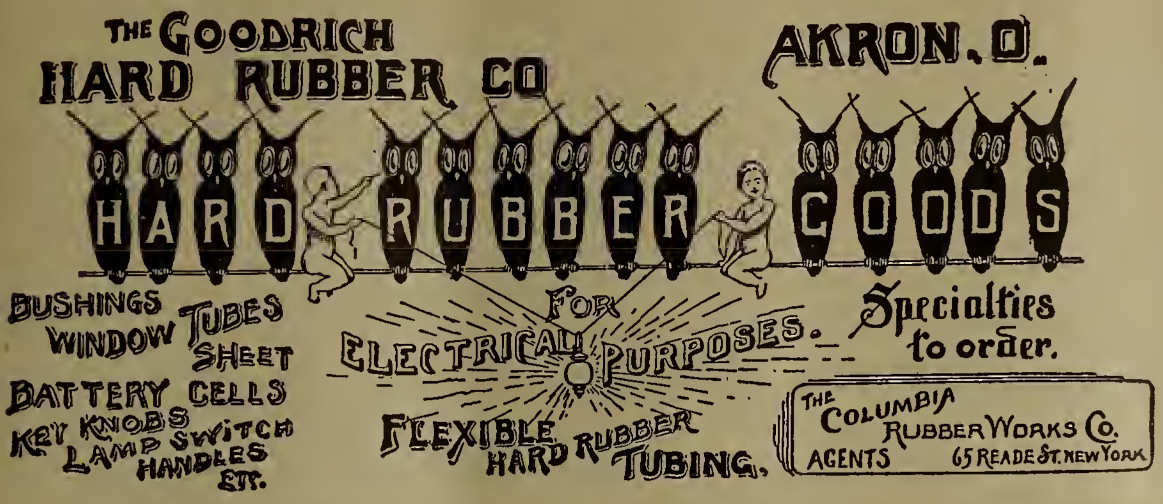

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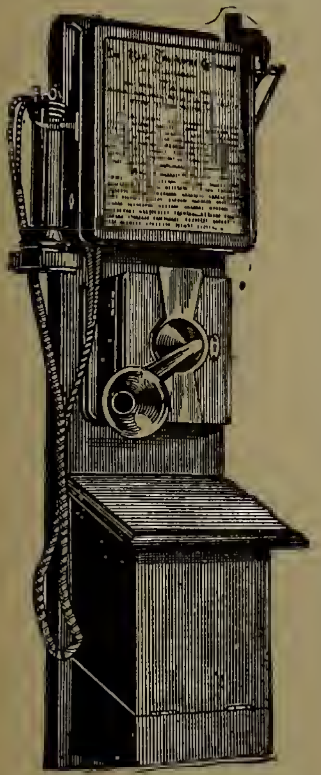

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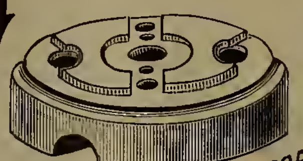

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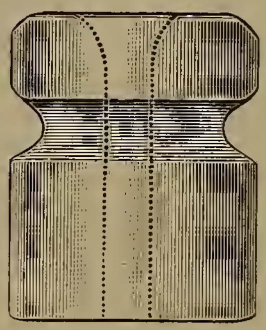

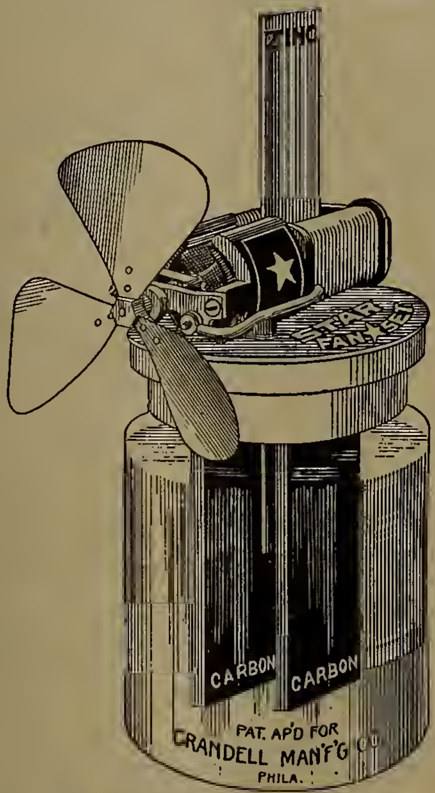

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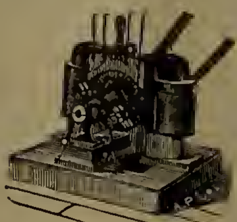

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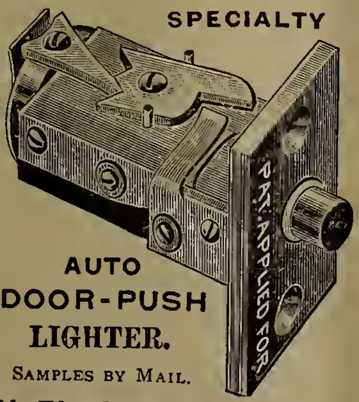

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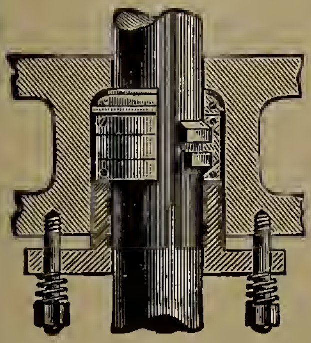

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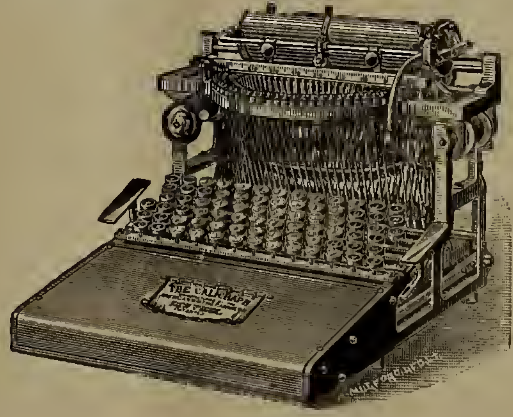

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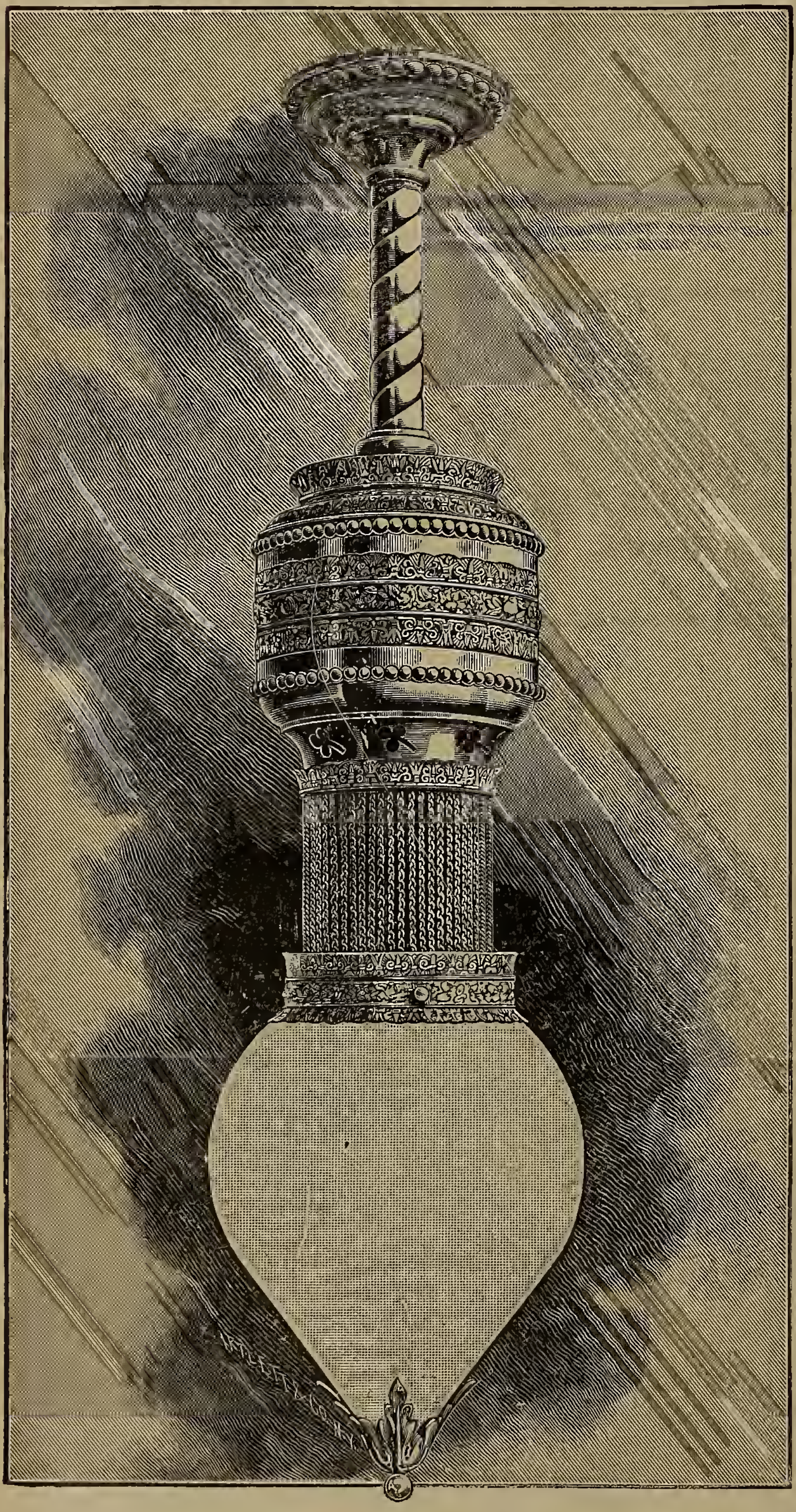

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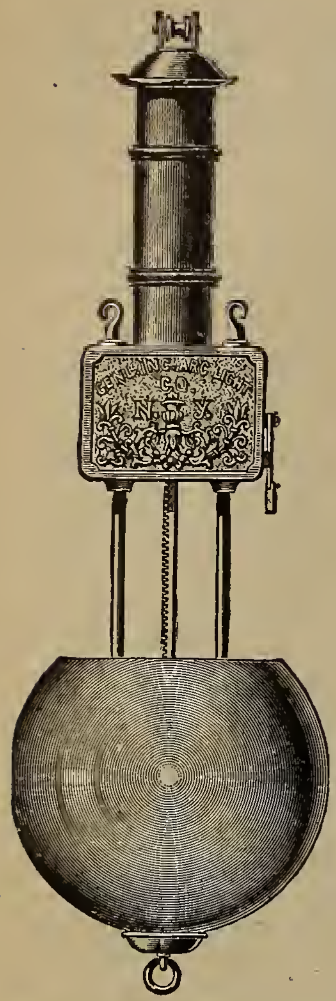

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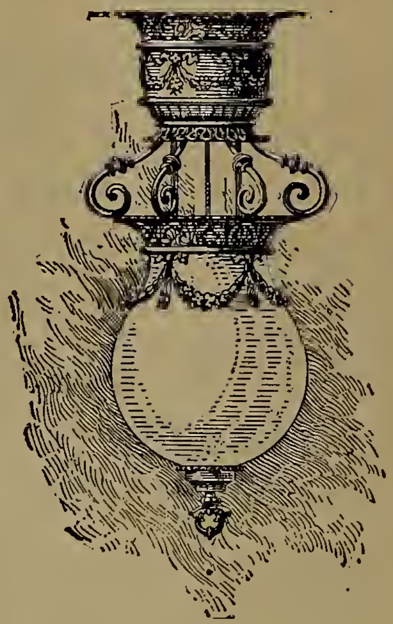

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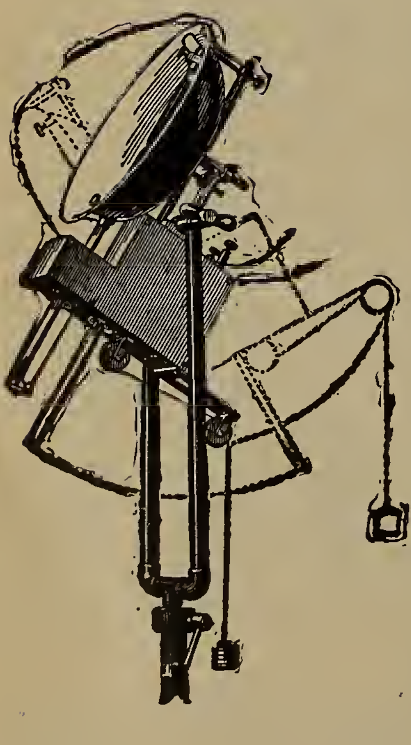

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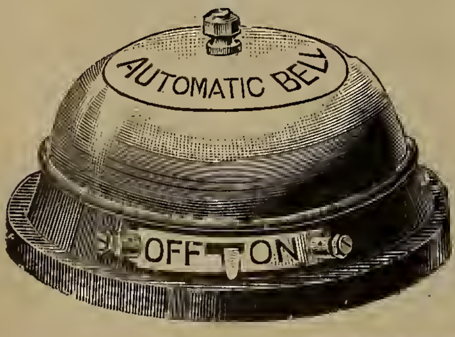

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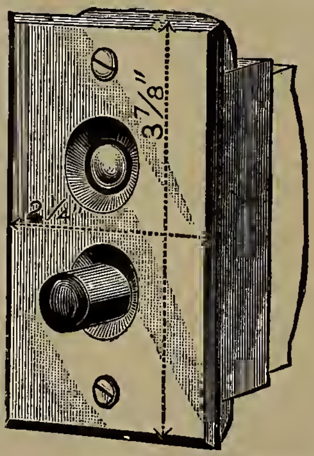

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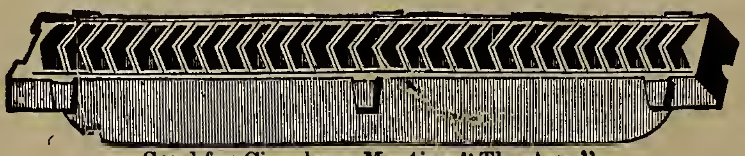

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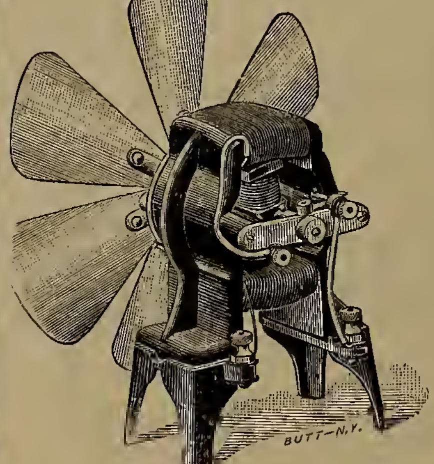

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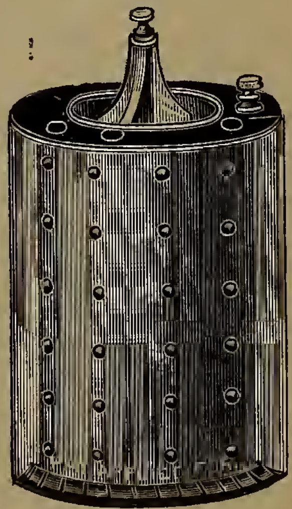

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NEW YORK, JULY 1, 1893.

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THE STREET RAILWAY CONVENTION.

Although the next meeting of the American Street Railway Association will not take place until October of this year, there is evidence already that the officials are not laying idle. Secretary Richardson has provided us with a partial list of the intending exhibitors at the Convention, and from the character of the names shown therein it is reasonable to infer that the exhibition feature of the convention will be an unusally large and interesting one. The convention will be held in Milwaukee, Wis., the third Wednesday of October, and no doubt there will be a large attendance on account of the opportunity, so conveniently presented, to visit the World's Fair at Chicago.

USE OF ROPE FOR POWER TRANSMISSION.

We publish in this issue the conclusion of Mr. James M. Dodge's article on "Rope Power Transmission."

Some very successful rope power transmission plants have for many years been in operation in Europe; but it is a more recent practice in this country. The author gives much space to the description of the rope sheaves as regards their construction and shape. The splice of the rope is a matter of much importance and if not made in a proper manner soon causes deterioration of the rope due to slipping on the sheaves. The author did not state what the relative strengths of the rope and of the splice were. This point would seem to be of importance in figuring the size of rope to be used in the transmission of a given amount of power. A discussion of the relative merits of different kinds of rope is entered into and much valuable information given in regard to points of operation of rope power plants. A method is illustrated of determining the horse power that can be safely transmitted on a rope of given cross-sectional area. The article concludes with a description of several of the parts which make up a complete rope power transmission plant.

CABLE ROADS.

We publish this week an article on "Notes on Cost of Operating Cable Railways," by Mr. D. Bontecou. The article treats of cable roads from a financial point. Much data and information is given in regard to the economics of a cable system and for illustration, the construction and the operating expenses of a cable road is given. By means of this data and that of electric roads, the relative costs of the cable and the electric system may be computed.

NEW YORK RAPID TRANSIT.

Now that the rapid transit problem of New York city is in a fair way to be solved, it would seem that it shoud be of great interest to electrical men.

Extensions are to be built to the existing elevated lines, within the next few years, and if as these were being constructed, the electric system was introduced on them, it would probably in time extend over all the elevated railroads in the city. A good modern electric conduit system could be put to valuable service in an installation of this kind. There would be little danger of electrical loss due to leakage, the conduit could be easily drained, and as there would not be many crosslines or switches, a very smooth running road would result.

The speed of the trains could be increased, and the noise and dirt of the present steam system greatly reduced. To any one living near the present elevated railroad these last two considerations should have considerable weight in an argument for eleciric elevated railroads.

PECKHAM TRUCK No. 6 C.

The Peckham low-down, double extension truck, No. 6 C is illustrated below. This truck is more especially designed for open cars, but adapted as well to closed cars.

Fig. 1 shows this truck complete and Fig. 2 gives a are machine fitted in a careful manner, and the canti- view of one of the cars equipped with this style of truck recently put into service on the Court street line of the Brooklyn City Railroad Company, Brooklyn, N. Y. All of the meritorious features possessed by the other types of Peckham trucks are contained in this. All the parts lever extension side frames are constructed with hot rivets. The extra end truss extensions of the side frames are permanently constructed and in replacing a set of wheels it is not necessary to remove them. They are adjustable to any desired angle or height. The side frames of the trucks are supported upon the journal boxes by graduated spiral springs while the flexible motor hangers allow freedom of motion to the heels of the motors.

The dimensions of the 6 C truck are ; extra length of truss extensions 21 feet; length of solid forged top frames 16 feet ; length of spring base 12 feet 6 inches ; wheel base 6 feet 6 inches ; height of truck, equipped with 30 inch wheels and empty car body, 26 inches.

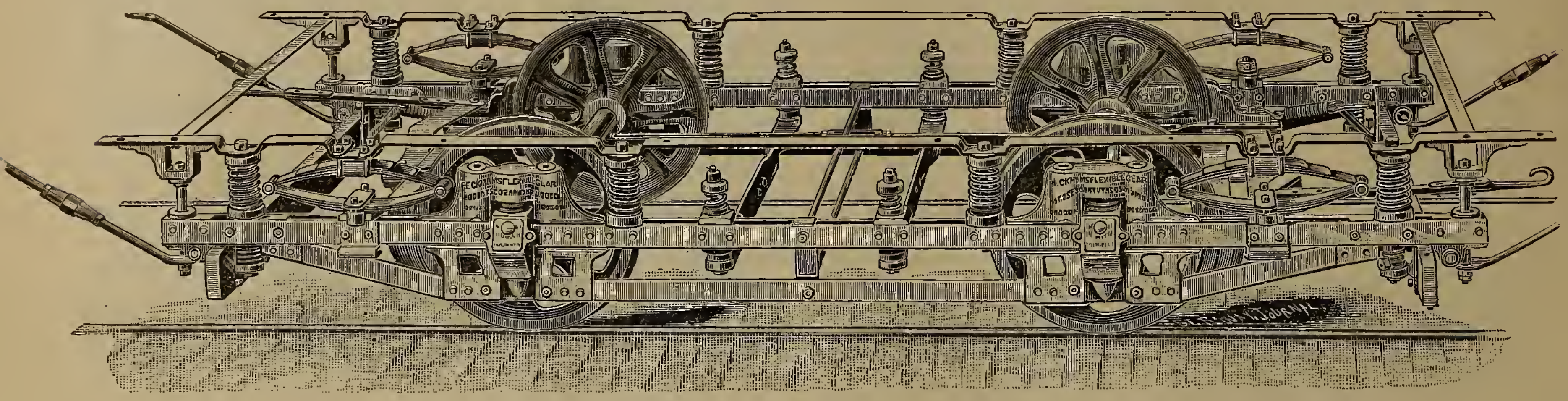


FIG. 1—PECKHAM DOUBLE EXTENSION TRUCK FOR OPEN CARS.

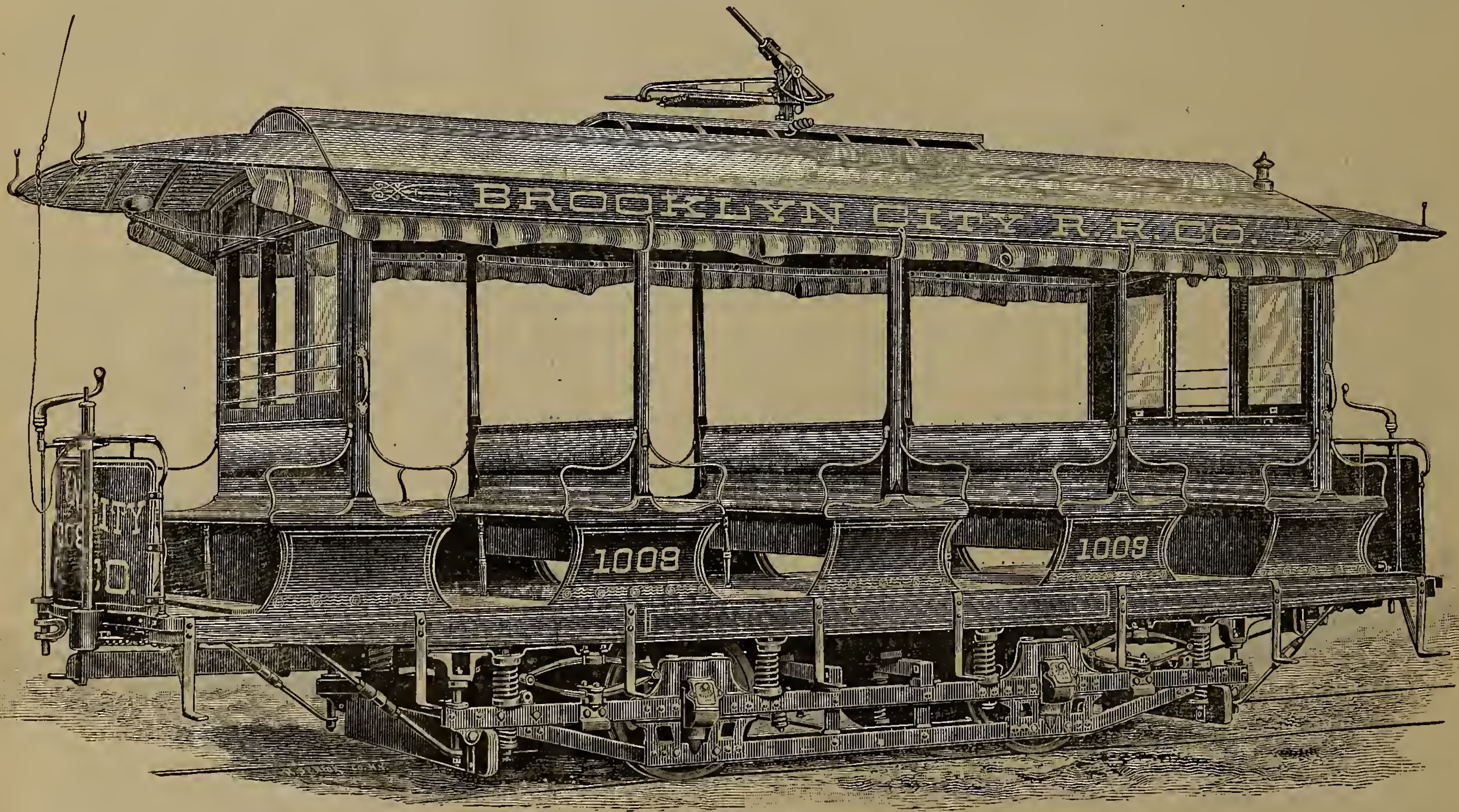


FIG. 2—OPEN CAR BROOKLYN CITY R. R. WITH PECKHAM EXTENSION TRUCK.

Oscillation of thirty foot cars is said to be entirely prevented, and easy riding is secured by the use of these trucks.

The Brooklyn City and Atlantic avenue Railroads of Brooklyn, have adopted this truck under their open cars and have some 300 of them in use.

These trucks are manufactured by the Peckham Motor Truck and Wheel Co., New York city.

A Long Cable.—The Central and South American Telegraph Company has successfully laid its duplicate cable by aid of the steamship Silvertown. It extends in three sections from Salina Cruz, Mex., to Chorillos, Peru, via San Juan del Sur Nicaragua, and Santa Elena, Ecuador, and is nearly 2,500 miles long. Mr. Herbert Kingsford, engineer and electrician, superintended the laying operations of the cable, which was manufactured in London, England.

THE MASON ELECTRIC COMPANY.

The Mason Electric Company has recently been incorporated under the laws of the State of New York. It is an enterprising company and is well abreast of the times. The company has its place of business at 10 and 12 Vandewater street, New York city, where it is fitting up its office, salesroom and assembling room in a fine manner.

The officers of the company are: Mr. A. Vanderwerken, president; James H. Mason, vice-president and manager; A. Vanderwerken, Jr., treasurer; F. B. Johnson, secretary. Mr. A. Vanderwerken, the president of the company, is a retired lawyer and is a successful business man, being well fitted for the position which he holds Mr. James H. Mason, the vice-president and manager, is the well-known inventor of the Mason battery, one of the most successful and reliable cells on the market. He has had 20 years of practical experience in the electrical industry and is therefore well equipped to be at the head of the electrical work of the company. He is also well-known as a lecturer on electricity as he has delivered several, before clubs and in churches, in Brooklyn and vicinity. The lectures were very well received and much praise and applause accorded to Mr. Mason. Mr. A. Vanderwerken, Jr., the treasurer, is a lawyer by profession and is also a smart and energetic business man, well able to take charge of the finances of the company. Mr. F. B. Johnson has had eight years of practical experience in the electrical business and is well fitted to carry on his work. In the accompanying illustrations are shown the gentlemen mentioned.

A. VANDERWERKEN.

JAMES H. MASON.

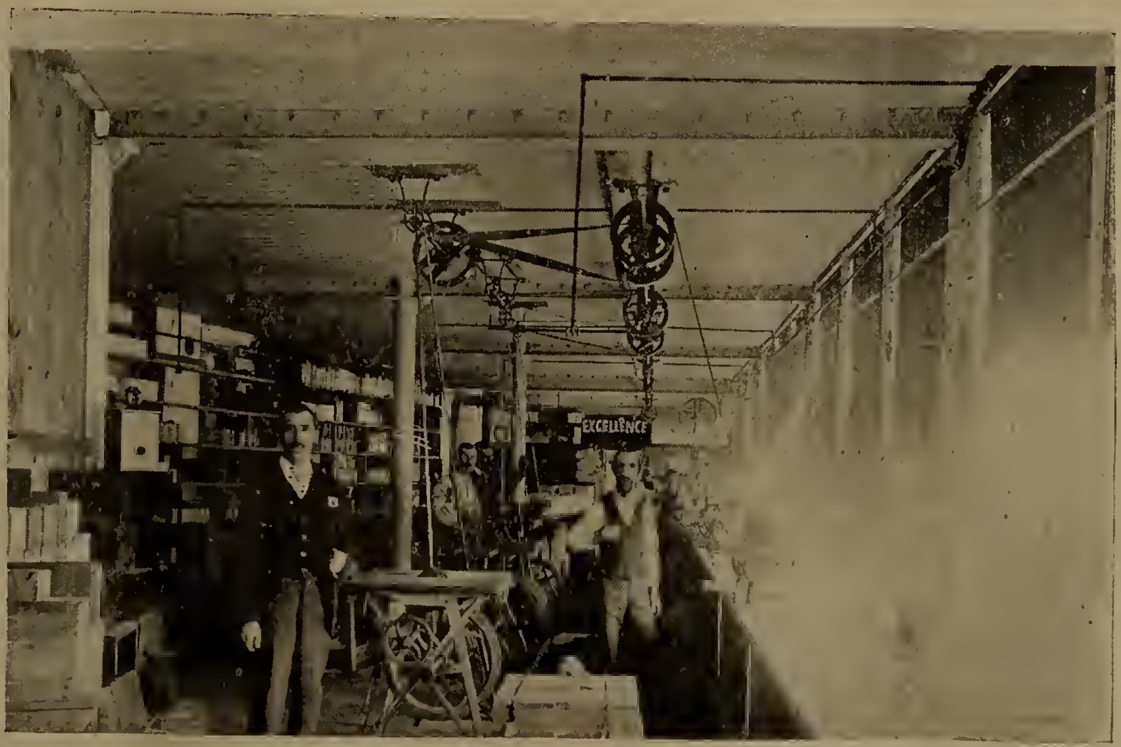
The company carries on an electric supply business, in connection with the sale of the well-known Mason batteries and Mason specialties. The Mason cells have established for themselves an enviable record for reliability and endurance. The E. M. F. of a No. 1 cell is about 2 volts and the No. 2 has an E. M. F. of 2.01 volts. From tests that have been made on the cell results have been obtained which show a wonderful endurance even when the cell is short-circuited for a long time. The Mason motors for fan and power use are deservedly popular. They are designed to run by current furnished by a primary battery and are applied to numerous uses in the shop, office, and household. The Mason batteries are also used in connection with incandescent lamps, for reading lamps, etc., as well as for surgical and dental purposes. Many convenient combination sets of battery and motor are made and sold by this company.

A. VANDERWERKEN, JR.

F. B. JOHNSON.

The office and assembling rooms of the company are situated in the handsome building at 10 and 12 Vandewater street. The interior view of the room, 109 feet long by 30 feet wide, is shown in the accompanying illustration. One whole floor is used and the space divided up into five rooms. The largest room is the assembling room where the goods are assembled and finished. It contains the necessary machine tools and the plant is driven by a 5-horse power Eddy motor. The room has many windows and is a light and pleasant workshop. Two rooms in the rear are used as storerooms. A large and handsome salesroom is being completed where the many styles of goods handled by the company are to be tastefully displayed. The office is well situated in the corner of the building.

The company, although young has displayed a pushing and energetic policy and it is reasonable to suppose that it will build up for itself lucrative business.

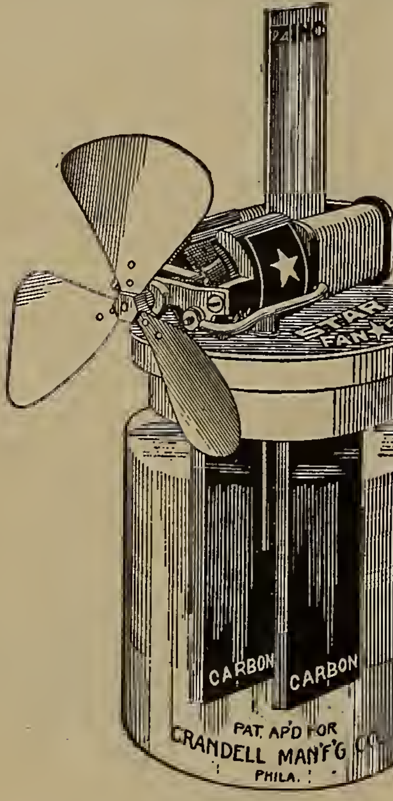


INTERIOR VIEW OF ASSEMBLING ROOM.

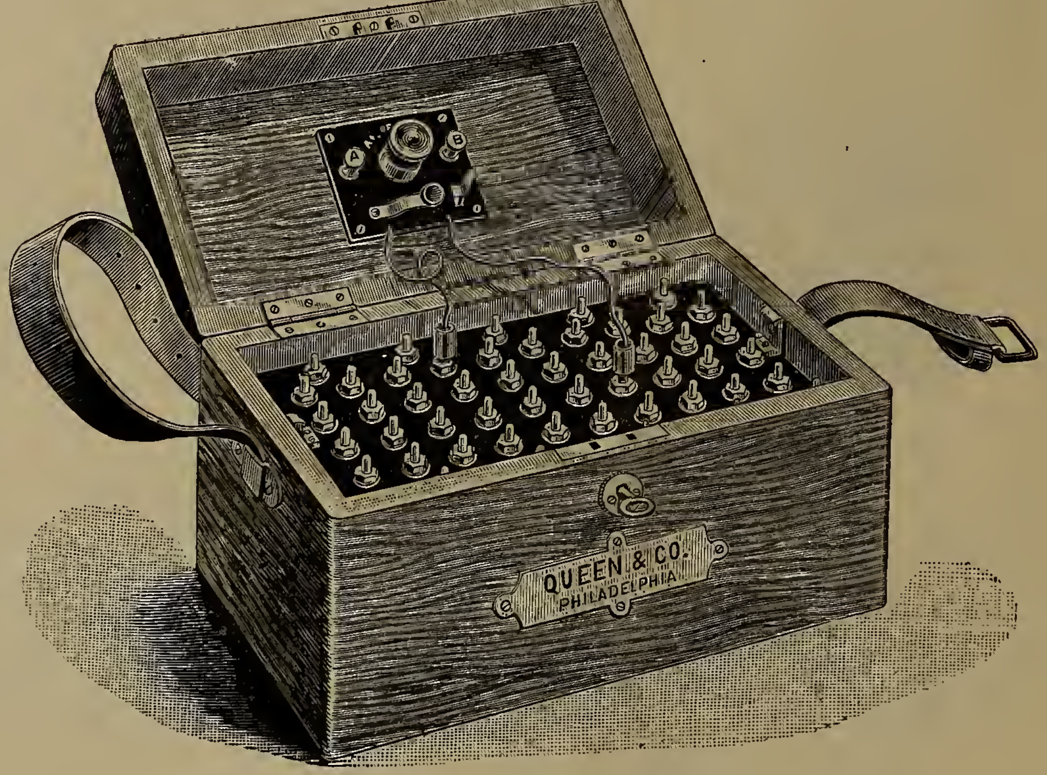
FAN MOTOR AND BATTERY.

The accompanying illustration shows a very neat and desirable form of a fan motor set. The motor as shown, is fastened securely on the top of the cell and the whole apparatus occupies a very small space. The zinc can be raised out of the solution, thus stopping all battery action. Lowering the zinc, which is secured so as not to touch the carbons when moving, by means of long extensions, closes the circuit and starts the motor. The motor is of very low resistance and runs at high speed.

Mr. Crandell, the inventor, has been experimenting for several years and has brought out this Star fan motor and battery to meet the requirements of his many customers. An important feature in this set is the means of regulating the speed of the motor by the amount of zinc immersed in the solution. The crescent outfit consists of the Porter fan motor and two cells of battery enclosed in a wood case, convenient to carry about. The set is sold at a low price.



CRANDELL FAN MOTOR AND BATTERY.



ALUMINUM-IODINE PORTABLE TESTING BATTERY.

The Crandell Mfg. Company, 66 North 4th street, Philadelphia, Pa., is the maker of this apparatus.

THE ALUMINUM-IODINE PORTABLE TESTING BATTERY.

The testing battery illustrated herewith is a new form that has been thoroughly developed in the experimental department of Queen & Co., incorporated, Philadelphia, and is now placed on the market by this company with expectation of a large demand.

In chemical composition the "Aluminum-Iodine" cell is quite different from anything heretofore known, and possesses important features the most essential of of which is the electro motive force. Each one develops a voltage of $1\frac{4}{10}$ volts, which is fully 50 per cent. more than the output of an ordinary "Chloride of Silver" cell. The effect as will be seen, is that 50 Aluminum Silver cells have the same efficiency as 75 of the other type, so that great economy in first cost results.

The cells are prepared with great care, and those used in the laboratory of Queen & Co., for months past have shown remarkable constancy and long life. There is no danger of explosion or leakage, and local action is practically eliminated, so that when not in use there is no injurious waste.

The cells are mounted in handsome polished mahogany cases in sets of 50, more or less as desired. A battery of 50 cells gives 70 volts E. M. F., which is quite sufficient for all ordinary work. Electrical engineers in testing the insulation of sub-marine or underground cables often require 200 or 300 volts to secure proper sensibility in results, and a battery of as many cells can readily be prepared if desired.

The "Acme" Portable Testing Set also manufactured by Queen & Co., contains twelve "Aluminum-Iodine" cells, which they propose to use entirely in place of the regular "Chloride of Silver" form.

The makers are prepared to meet a large demand for this new specialty, and interested parties should write them for a copy of descriptive circular No. 445.

A Talking Catalogue.—Mr. Marshall, the maker of condensers, University Building, New York city, has his condenser telephone made up in one of his catalogues, laying on his desk, each sheet of paper has a layer of tin foil attached, and each alternate sheet is connected to the poles of the receiving wire, you can hear the voice in the room or office and can not tell where it comes from, until Mr. Marshall hands you his catalogue and says here is the invisable voice. You can receive with his condenser telephone without holding it to your ear.

BEST SATISFACTION, BATTERY AND CURRENT.

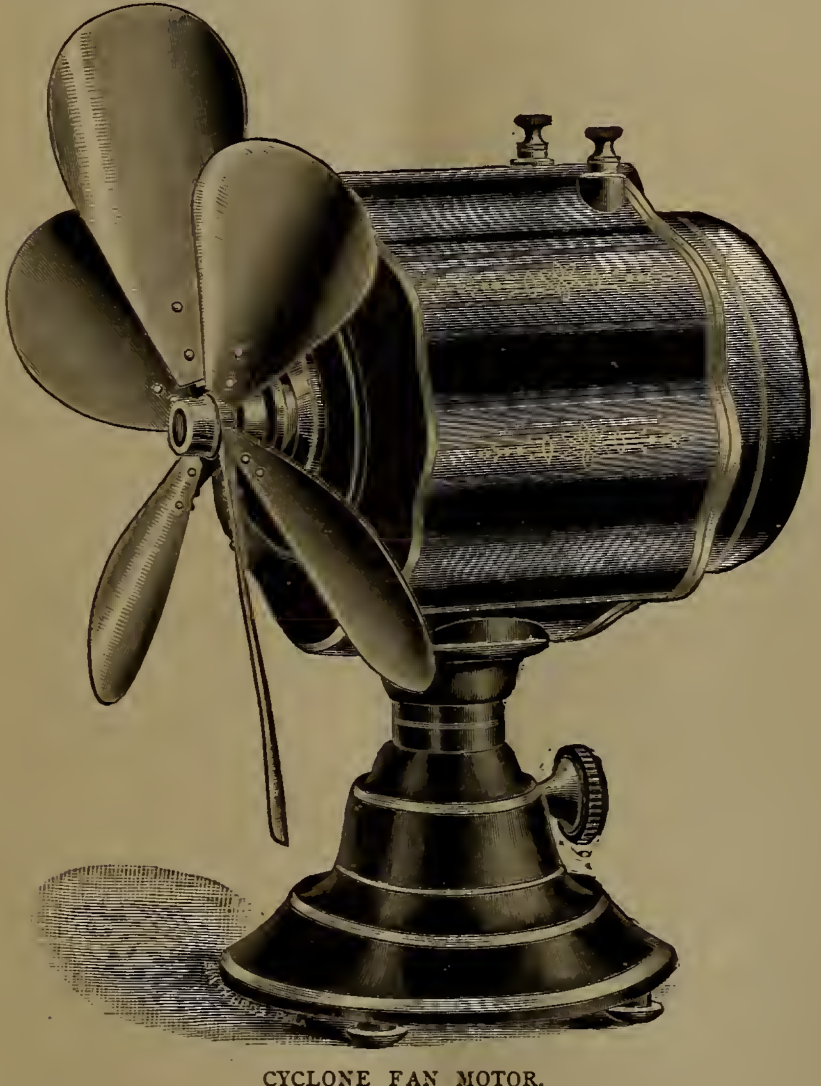
E. M. Druley, M. D., of Stafford, Conn., writes to Jerome Kidder Manufacturing Co., 820 Broadway, New York: "I have used your battery in most all diseases, and find they give the best of satisfaction. Had a case two weeks ago, of occlusion of the bowels. After everything failed, succeeded in moving the bowels the second application. I consider yours to be the best battery that is made. Gives the best current."

Sensitive Galvanometer—The Thomson mirror galvanometer is an extremely sensitive instrument. Such an instrument wound with a resistance of 6,000 ohms, when properly adjusted, will give a deflection of one division on the scale with an electromotive force at its terminals of one millionth of a volt.

CYCLONE FAN MOTOR.

Fan motors are placed on the market in a great variety of styles. From the number of such devices being introduced, it is apparent that the field for these small and useful articles is fast broadening.

In the accompanying illustration is shown a fan motor which has many admirable features. It is made up in a neat and compact form, and, with its handsome finish, presents an ornamental appearance. It is entirely enclosed, thus preventing dust and foreign articles getting into the moving parts. The cap on the back can be removed and all parts inspected and taken out very easily. Themotor is provided with fiber bushings, Siemens armature, lignumvitæ bearings, carbon brushes, and has a rheostat in the base which is adjusted by means of the thumb screw shown in the illustration. The motor is wound for 110 volts, direct current; and is provided with speed regulator, a switch, if desired. The motor has self oiling bearings, and runs noiselessly at any one of three different speeds. It is entirely iron clad and is claimed to be one of the most efficient small motors in use. A ten-inch fan is used in this outfit.


CYCLONE FAN MOTOR.

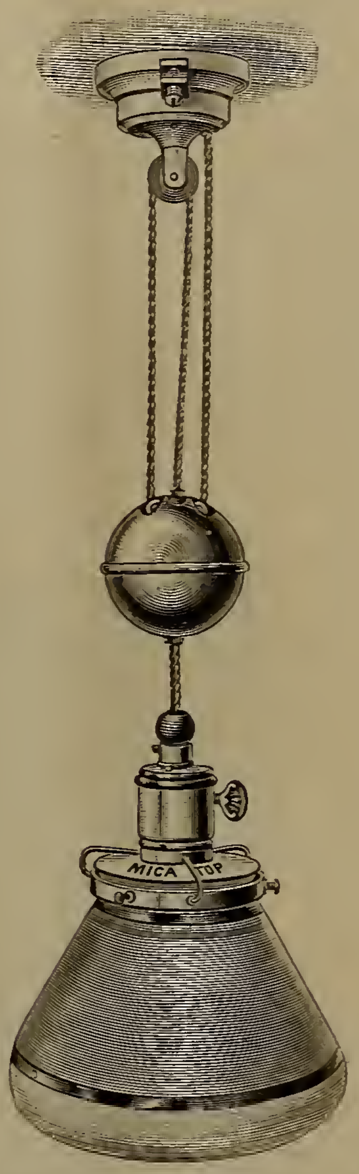
The cyclone fan motor is made by the Standard Electric Company, 2246-2248 N. Ninth street, Philadelphia, Pa.

PHOTOGRAPHING THE FLIGHT OF BULLETS—At a recent meeting of the Glasgow Philosophical Society Dr. J. F. Bottomley described the method of photographing rifle bullets during their passage through the air. The photograph is taken by an electric spark from a Leyden jar. Under certain prearranged conditions the duration of such a spark, as calculated by Professor Boys, of the Royal College of Science, South Kensington, is about one-twentieth of a millionth of a second. It is a spark of this kind that is used in photographing bullets. The bullet is photographed as it leaves the rifle. On its emergence from the barrel it strikes a pair of wires, thus closing an electric circuit, and causing an electric spark.

ADJUSTABLE HANGER FOR INCANDESCENT LAMPS.

Great improvements are being made all the time in the decorative and useful effects in electric light installations. Many specialties are being introduced in this line, one of these is the Columbian Adjustable Hanger, a view of which is given in the accompanying illustration.

The hanger differs from others in the market in many respects. It has no differential pulley, shade roller, or spring to get out of order, but has simply a balanced weight divided equally on the cords, which can be easily adjusted. When placed on the market, it is complete, all ready for the lamp, the parts which make up the complete hanger are as follows: a McCreary seven-inch reflector, weight, flexible cord, porcelain cut-out and fuse, and any desired style of socket.



HANGER FOR INCANDESCENT LAMPS.

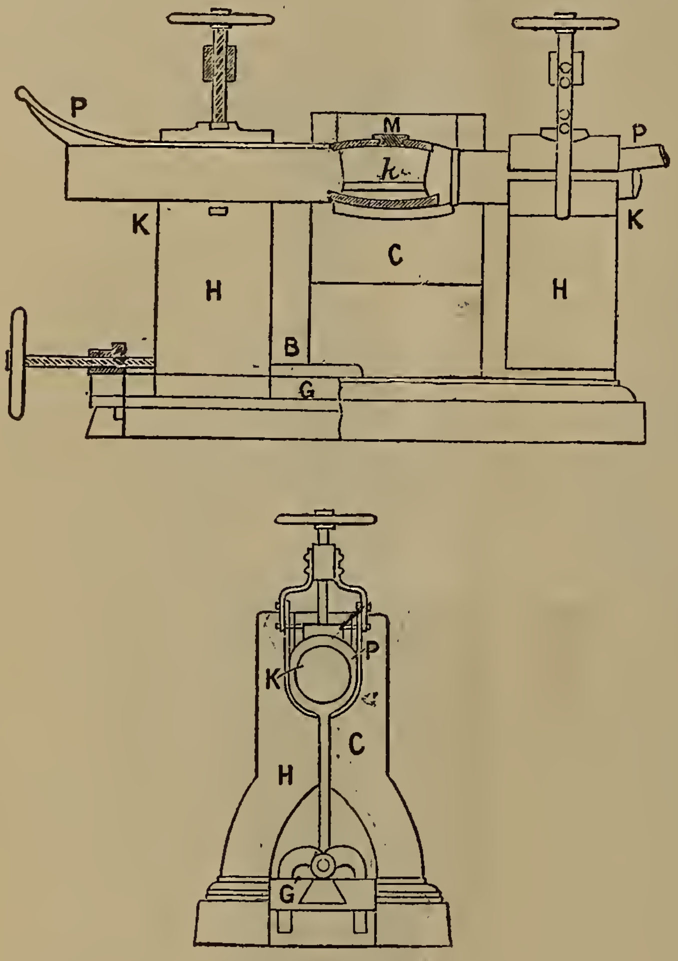
The complete device is placed on the market at a very low figure by the McCreary Electrical Specialty Company, 136 Liberty street, New York city.

ELECTRIC STEAMSHIPS—Messrs. Harland & Wolff, of Belfast, Ireland, the well-known builders of ocean-going steamers are reported to have expressed the opinion that electricity may in the near future achieve great things in the direction of increasing the speed of ocean steamers. They do not look for much more progress in this line with steam power.

INSULATION TESTS—Dr. J. T. Bottomley, the English electrician, strongly advocates the use of a very sensitive high resistance galvanometer, with proportional graduation, in testing the insulation of electric light wires, and a direct comparison between the insulation of the installation to be tested with high resistances prepared for the purpose.

ELECTRICITY IN METALLURGICAL OPERATIONS: LABORATORY FURNACES.*

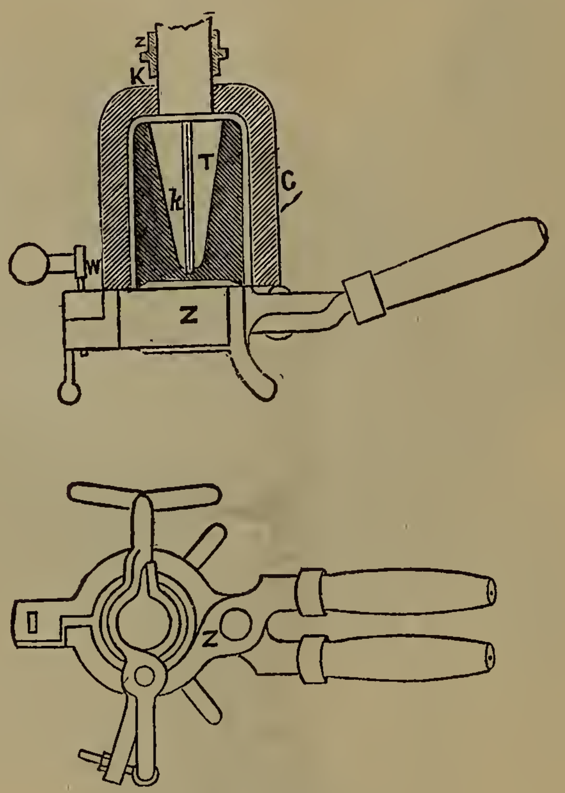
But a short time ago, we hazarded the opinion that in the future the only function left for coal gas to perform would be the supplying of heat. Already its original function as an illuminating agent has been wrested from it, and now so quickly do we progress, that its position as a thermal agent is being challenged. The most enthusiastic advocates of the general use of electricity for supplying power, light and heat, are scarcely too extravagant in their claims: for that which is dimly foreseen today becomes an accomplished fact tomorrow. Within the past few months it has been completely demonstrated that electricity can not only generate an intense degree of heat, but that the thermal power thus supplied is capable of useful application; the most refractory substances which have hitherto withstood every attempt to reduce them, have been compelled to yield in the electrical furnace.



FIGS. I AND 2.

For assay work and general operations of this kind in the metallurgical laboratory, gas has hitherto held its own; but even in this field it will have to give way to electricity. Already the adaptation of the electrical current to these operations has been successfully carried out. In Germany, Herr W. Borchers, whose "Electrometallurgie" is one of the leading works on this subject, has elaborated some apparatus which will, we believe, replace all gas furnaces for metallurgical work. He gives a detailed account of several forms of electric furnaces, etc., in a paper which may be consulted in the *Zeitschrift für Angewandte Chemie*, 1892, pp. 133–136. In this paper, telling arguments are stated in favor of the use of the electric current in metallurgical laboratories which point to its convenience, its rapidity of action, its cleanliness and its efficiency, and the author then proceeds to give details of the construction of the apparatus, by means of which the thermal power of the current is employed.

Figs. 1 and 2 give views of a form of furnace which is specially suited for roasting metallic ores. K, K, are carbon rods, about 25—30 mm. in diameter, connected by means of another carbon rod, 4 mm. in diameter, and 50 mm. long. This enclosed in a muffle of fireclay or magnesia, M, which contains the ore to be roasted. The muffle is surrounded with powdered charcoal when it is desired to keep the ore from the oxidizing action of the air; this also reduces the loss of heat by radiation, owing to its non-conducting properties. When, however, it is desired to heat the metallic substance under treatment in contact with the air, a fireclay trough C, is provided, which serves to contain the open vessel in which the substance is placed; it resembles the muffle, M, split longitudinally. H, H, are holders which carry the corbons, K K; they play upon a slide, G, by means of which they can be brought and kept in contact by a spring or screw. The slide, &c., is protected from dust by the sheet-iron cover, B, and all the parts can easily be disconnected in order to facilitate cleaning. The leads which end in the copper plates, P, P, are clamped, saddle-wise, on the carbons, or attached in any other convenient way to the carriers, which are mounted on an insulated stand.



FIGS. 3 AND 4.

Figs. 3 and 4 show details of an apparatus which is specially designed for conducting fusions and reductions when the use of an iron crucible may be permitted. T is the crucible, and is supported by the iron clamp, Z, fastened by the key, W, and serving as a conductor of the current, as well as a support to the crucible. A carbon pencil, 4—6 mm. in diameter, serves to effect connection with the crucible, and a carbon rod, K, 30 mm. in diameter, which is carried in a clamp connected with the other conductor, in a manner similar to that described for the crucible itself. C is a fireclay shield, with an outer sheet-iron cover, designed to protect the crucible and check radiation. It is provided with a small opening, through which the progress of the operation can be observed.

When very high temperatures are desired—that is to say, when very refractory substances have to be dealt with, the furnaces shown in Figs. 5, 6 and 7 are most suitable.

The crucible is set upon a cast-iron stand, which consists of a bed-plate, F, with side pieces, B, S, the latter of which are movable and can be brought up towards B by the wrought-iron band, Z, which is worked by means of a screw or spring. In both the side pieces, B and S, a small groove is cut for the reception of the iron plate, G, upon which is placed a slab of asbestos or fire-clay, A. Rings of gun-metal, etc., may be used in order to make crucibles of different sizes fit; one of these is shown at L (Fig. 5). Another device for the same purpose is shown at Fig. 7; it consists of a series of springs, E, E, made of strips of metal, 5 mm. wide and 1 mm. thick; these make connection with the crucibles and serve to support it.

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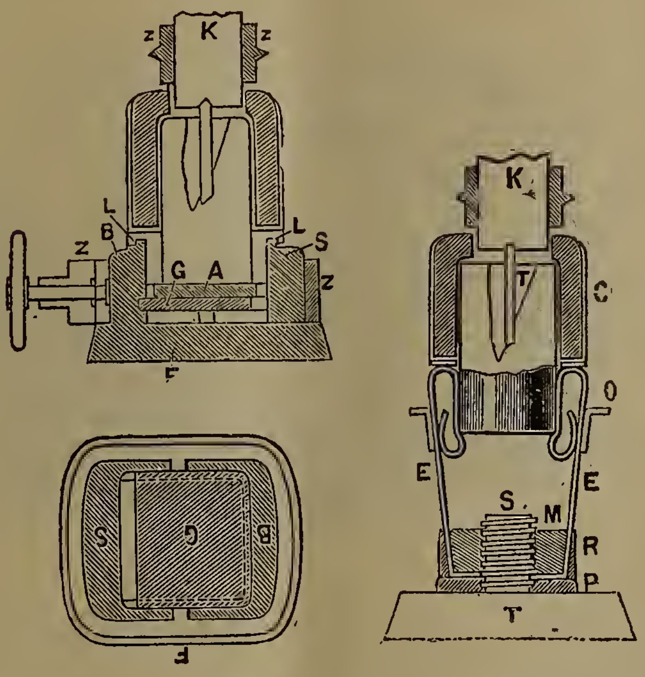
* *London Electrical Review.*



FIGS. 5, 6 AND 7.

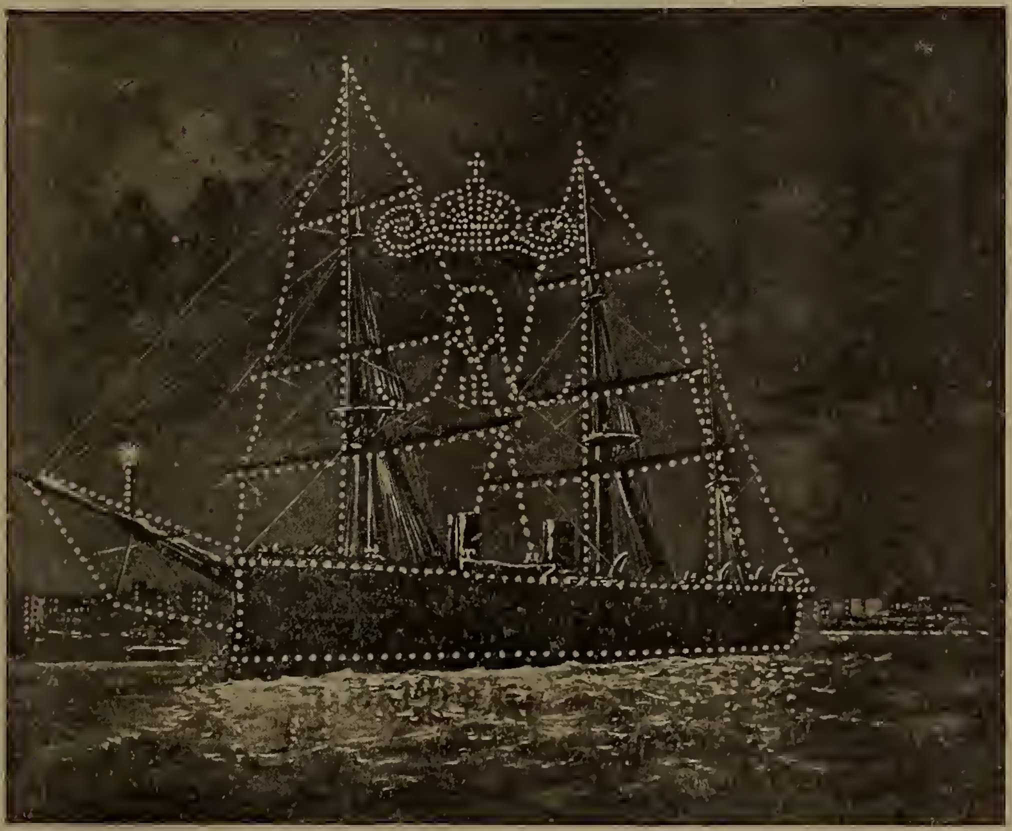
These forms of electrical furnace require very simple management. The only precaution necessary being to turn on the current gently, and not to exceed a current density of 5 amperes per square mm. of the cross-section of the carbon rod embedded in the charge. For ordinary purposes this current density is ample; when it attains 6 amperes per square mm., a temperature sufficent to reduce alumina is attained.

In the paper in which Borchers describes these apparatus, he gives various experimental data. He found that with commercial carbon pencils an E.M.F. of 0.3 volt is necessary to send a current of 1 ampere per square mm. of a carbon pencil 10 mm. in length. In dealing with a very refractory substance, he observes that a carbon 4 mm. in diameter and 45 mm. in length was used, with a current of 60 amperes and 8 volts, *i.e.*, 480 watts, corresponding to an expenditure of 0.8 of a horse-power. Other data are given, for which the original paper must be consulted.

MARINE ILLUMINATION.

The decorative illumination of war vessels by means of small incandescent lamps was a new wrinkle introduced with great effect during the recent Columbian Celebration in New York, and the beautiful scene at night when the vessels were outlined in light against the black background of the night was not the least attractive part of the famous naval display.

The occasion of the birthday of the Czarewitch gave the Russian admiral a chance to distinguish himself, and offer to the expectant public a view of his vessels at once beautiful and effective. The cut gives some idea of the illumination of the "Dmitri Donskoi." The vessel was outlined in lamps from truck to water line, while between the masts was suspended a brilliant reproduction of the initial letter of the reigning Romanoff's name, surmounted by the Russian Imperial crown formed of scintillating lamps of different colors. In the position on the bowspirit usually occupied by the "Jack" gleamed a small bright star.



A MARINE ILLUMINATION.

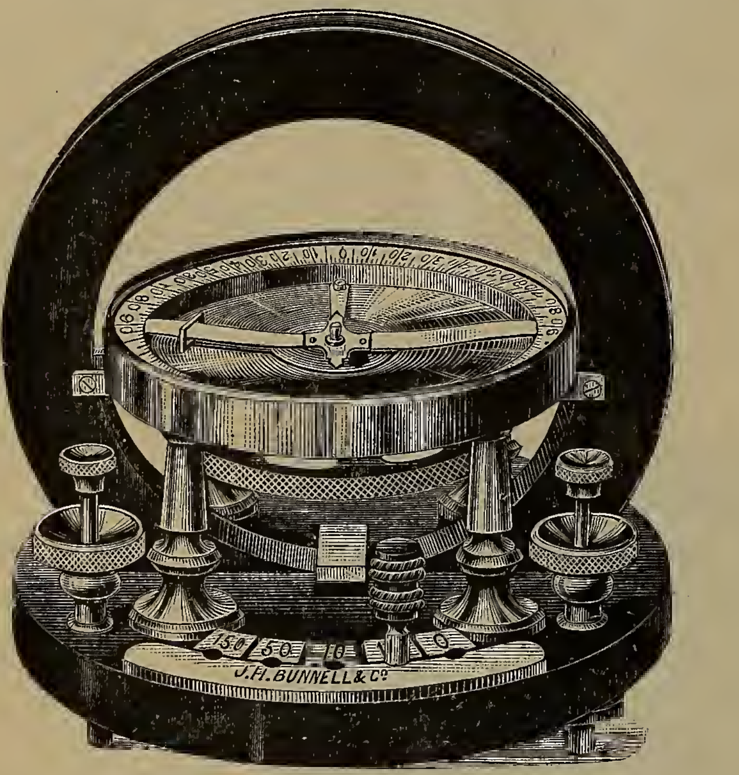
The "Rynda's" decorations consisted of the crossed Russian Naval and American flags surmounted by a five point star.

The work was done by the Lamp Department of the General Electric Company, under the immediate supervision of Messrs. G. C. Baillard and C. A. Gundaker, while Lieut. André de Pekrowsky of the Dmitri Donskoi himself a skilled electrician, lent valuable aid in effecting the installation.

ELECTRICAL INSTRUMENTS.

The following is from the catalogue of the exhibit of the United States Navy Department, at the World's Columbian Exposition, and is a fitting tribute, to one of America's greatest electrical industries. The instruments described are made by the well known firm of J. H. Bunnell & Co., New York city.

"N. 2595. One W. U. Standard Tangent Galvanometer, in case, J. H. Bunnell & Co., New York. This instrument is handsomely mounted on a circular hard rubber base, 7⅜ inches diameter, provided with leveling screws and anchoring points. The galvanometer consists of magnetized needle ⅞ inch in length, suspended at the centre of a rubber ring 6 inches in diameter, containing the coils. The coils are five in number, of a reistance of 0, 1, 10, 50 and 150 ohms. The first is a stout copper bank of inappreciable resistance, the others are of different sized copper wires, carefully insulated. Five terminals are provided, the plug-holes of which are marked respectively, 0, 1, 10, 50 and 150. The ends of the coils are so arranged that the plug inserted at the terminal marked 150 puts in circuit all the coils; at the terminal marked 50, all except the 150 ohm coil; and so on, till at the zero terminal only the copper band is in circuit. Fixed to the needle, which is balanced on jeweled points, is an aluminum pointer at right angles, extending across a 5-inch dial immediately beneath. On one side the dial is divided into degrees; on the other it is graduated, the figures of the scale corresponding to the tangent of the angles of deflection. Fig 1.



W. U. STANDARD TANGENT GALVANOMETER.

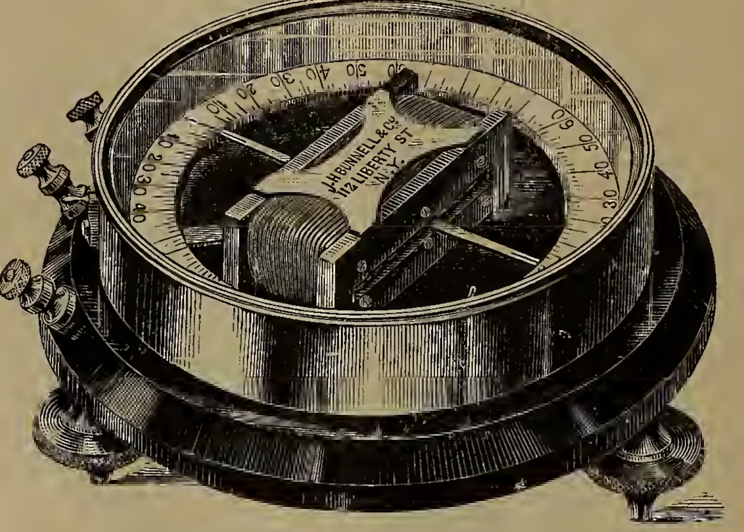
"N. 2596. One Large testing Set Galvanometer and Rheostat, in leather case, J. H. Bunnell & Co., New York. Sensitive horizontal needle galvanometer with magnifying reading lens, 3 coils, 0, 40 and 100 ohms resistance and combined bridge (Wheatstone) and rheostat, covering all ranges of measurement direct from 100 to 11,000 ohms, and with bridge having in each side coils of 10, 50, 100, 150 ohms, admitting thus of multiplying measurements up to 550,000 ohms. Figs. 2 and 3.

(*To be Continued.*)

English Humor.—Referring to the use of the name "Ampere" for the town in New Jersey where the works of the Crocker-Wheeler Electric Co. are located, the *Electrical Engineer*, of London, states that it is likely the beginning of a movement which will give us in the future "Voltaville"; "Faraday Junction"; "Ohmlands" and "Kelvinside."

CONVENTION OF RAILROAD TELEGRAPH SUPERINTENDENTS.

The twelfth annual meeting of the Association of Railway Telegraph Superintendents, convened at the Plankinton House, Milwaukee, Wis., at noon June 20, with Vice-President, U. J. Fry in the chair, in the absence of President L. H. Korty.

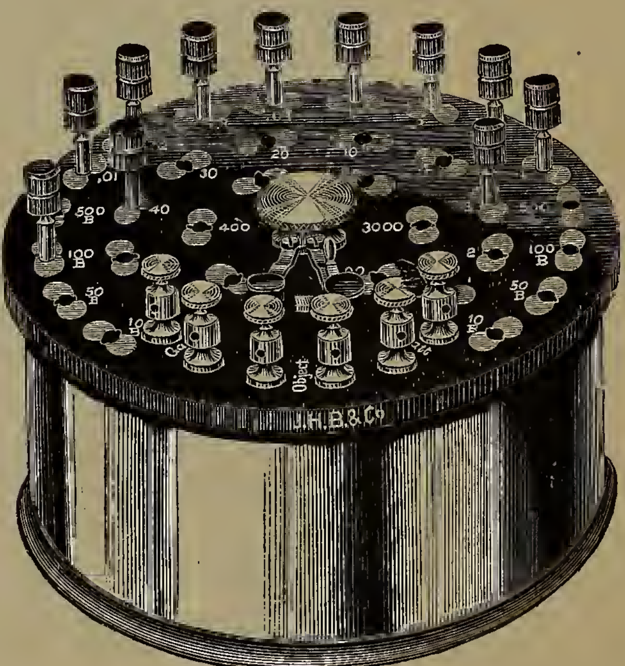

J.H. BUNNELL & Co.
112 LIBERTY ST.
N.Y.

GALVANOMETER.

The following named gentlemen were elected members: F. B. DeGarmo, Missouri Pacific Railway; D. McNab, Chicago Great Western; F. S. Spaford, Burlington, Cedar Rapids and Nothern; C. F. Annett, Illinois Central, and A. R. Pippitt, L. W. & S W. Texas.

The report of the treasurer was then read, after which the committee of arrangements made its report on the programme of excursions, etc.

At the afternoon session the feature was the delivery by phonograph of an address to the Association from Governor Peck of Wisconsin, the Governor being unable to be present in person. The address was plainly heard by all in the room, the assemblage including the wives and daughters of many of the members. The Governor welcomed the members to Milwaukee and the State and bespoke for them a hospitable reception. He spoke of the successful manner in which the commerce of the country is carrried on largely through the vigilance of the railway telegraph superintendents, and trusted that in their deliberations they would throw new safeguards around the people and system. Few accidents, he said, have occurred in past years through the neglect of telegraphers.



RHEOSTAT.

The committee on amendments to the constitution made its report recommending a change in Article III, which defines those who may become members of the Association. After considerable discussion which was participated in by Messrs. Swift, Lang, Sholes, J. B. Stewart, Lockwood and Drew, the recommendation was rejected.

(*To be continued.*)

NOTES OF THE CONVENTION.

The Edison Manufacturing Company, of 110 East 23d street, New York city, represented by Mr. W. S. Logue, kept the officers cool during the session with two Edison Ironclad Fan Motors. One fan motor was placed on the president's and one on the secretary's tables. Each fan was operated by three cells of Edison-Lalande battery, type "Q," and the breeze was very grateful. These fans are handsome machines, noiseless in operation, have self-oiling bearings, and are entirely enclosed in an ironclad case. The size of the box containing the battery is only 18¾ inches long, 7 inches wide and 9¾ inches deep. One charge operates the motor seventy-five hours.

Through the courtesy of the North American Phonograph Company, two Edison phonographs were used in a manner that shows their practical applicability to the work of reporting proceedings of deliberative bodies. As the remarks were made by members, they were repeated into the phonograph by an operator, by means of a mouth tube. The moment one cylinder was run through on one machine, the operator continued his dictation on the second phonograph, which was already prepared by an assistant. When the second cylinder was filled, the operator returned to the first machine, the second then being made ready for him while he was dictating to the first, and so on. In this way the dictating operator was enabled to keep right up with the proceedings without any break. The proceedings were afterwards transcribed from the phonograph on the typewriter. The value of this application of the phonograph obviously is the great saving of time effected. Portable cells of Crowdus battery were used to operatethe phonograph on this occasion.

It being the custom of the association to place on the honorary membership list the names of members who have left the telegraph service to engage in other lines of business, the following named gentlemen were made honorary members in accordance therewith: J. C. Ford, D. A. Smith, H. C. Reed, F. M. Duncan, C. H. Smith, W. P. Ward, L. Horton, Jr., and H N. Rowell.

The next order of business being the selection of place and time for the next meeting, Niagara Falls was chosen, and the third Wednesday in June the date set.

Officers for the ensuing year were then elected as follows: President, U. J. Fry, of Milwaukee; vice-president, George M. Dugan, of Chicago; secretary, P. W. Drew, of Chicago.

Mr. Fry is connected with the Chicago, Milwaukee and St. Paul road and Mr. Dugan the Illinois Central.

Adjournment was then taken until Wednesday morning.

HOW TO PROLONG LIFE—The London *Electrical Engineer* calls attention to an advantage possessed by electric surburban lines over steam lines, which is much appreciated by business men. On account of the much more frequent service on the electric line, and the custom of stopping anywhere to take on or discharge passengers, the business man need not worry about "catching a train" at any particular moment, at long intervals. True, this is a great advantage, but it is only one of the many.

OUTPUT OF DYNAMOS.

In the early days of electric lighting a machine that would run, say 200 or 300 incandescent lamps, says Mr. Arthur F. Guy, in the London *Electrical Engineer*, was considered to be a large-sized one, but as time went on, their output became greater and greater, until now, when the electric light may be said to be solidly fixed on sound foundations, for lighting, we have machines built for running 10,000 incandescent lamps of 16 c. p.; and for traction, machines of 2,000 e. h. p., or 1,500 units. The Westinghouse Company has put down 12 alternators for running the lights at the Chicago Exhibition, each capable of running 15,000 lamps of 16 c. p.; the armatures of these enormous machines alone weigh 18¼ tons each. These alternators are believed to be the largest yet run by belting, and it may not be long before such sizes as these, and in all probability larger than these, will be used for generating electricity in central stations. With arc lighting machines working at a constant current, there is a limiting factor, which is very difficult to get over, and that is the pressure. Every additional arc lamp in the circuit signifies another 50 volts pressure at the dynamo terminals. The largest continuous-current arc lighters run 60 lamps in series, and therefore they have a working pressure of 3,000 volts. It is very difficult to insulate armatures of continuous-current machines working above this pressure, the high pressure being ruinous to the insulation. In addition to the inability of the armature coils to withstand such pressures, the greatest care must be exercised by trimmers and circuit men in handling the lamps, wires, etc. Since a full arc lamp takes about 10 amperes, and absorbs a pressure of 50 volts or so, therefore 60 lamps in series will require 3,000 volts pressure to maintain a current of 10 amperes through the lot, so that a 60 arc lighter has an output of 30 kilowatts, or units, each lamp taking half a unit.

The output of the electric machines is reckoned in kilowatts, often called for shortness, units, because the kilowatt is the unit of electric power. This expresses the power of the machine or *rate of work* done, and the word unit applied as above must not be confounded with a Board of Trade Supply unit, which is often called a unit for shortness—this latter signifies a kilowatt of electric power working for the space of one hour, and producing a kilowatt-hour of electric energy, or *quantity of work* done.

There are many commercial data concerning dynamos that are very interesting and, what is more, extremely instructive. Among such are: weight, floor space, speed, output, etc., of machines compared with their first cost; and the different pattern machines can be compared, when figures can be worked out, given such data as number of watts a certain dynamo can develop per pound dead weight, the machine compared being of the same, or almost the same, output, speed, type, and such matters; then machines of greater sizes can be similarly compared. Another interesting matter to know is the number of watts per square foot of floor space machines can give for various sizes and speeds. A third matter is the cost per unit for various sizes and speeds. For all the above, curves can be plotted, and is surprising what a quantity of suggestive information can be gathered from them.

We regret to announce that Dr. George L. Austin, proprietor and editor of the two New England journals, *Practical Electricity* and *Electricity and Railroading*, succumbed to an attack of pneumonia at his home in Melrose a few days ago. Dr. Austin was as well known as any man in the electrical business.

QUESTIONS AND ANSWERS.

Correspondence from practical men upon topics of interest relating to electricity and kindred subjects, will find a place in this department.

The publishers, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Our readers are invited to avail themselves of this department when desirous of seeking or imparting information on questions of general interest.

A CURIOUS TRANSFORMER EXPERIMENT.*

By Rankin Kennedy.

An effect not hitherto described, was noted while making some experiments with transformer coils, an effect showing that the distribution of the iron inside of the coils of a transformer, has a considerable influence on the induction; besides showing this effect, the experiments are instructive and are worth describing, so that they can be repeated.

The primary and secondary coil respectively, are made up of No. 16 B. W. G. wire, about 200 turns; the coils are 12 inches long inside and 2½ inches wide; the secondary is laid on top of the primary, into the primary is sent an ordinary alternating current frequency 100 ~ amperes about 7 to 8. To the ends of the secondary a 12-volt incandescent lamp is fixed, under these conditions the lamp is heated only to a very dull red; if now, we insert iron stampings, of U-shape one by one into the coils, the lamp, of course, brightens up as each stamping is inserted, thus showing the effect of adding iron in the circuit. It will be also observed that the iron stampings tend to fly apart, and stand as far from each other as possible, and if we press them together and then let them go free, they will immediately fly apart. This is easily understood; but it is not so easily understood why that when the lamp is burning brightly with the stampings standing free to choose their own position in the coil and then when we forcibly press the stampings together, the lamp drops at once to a dull red, showing that the induction is much greater with the iron parted than it is with the iron compactly pressed up.

The iron stampings are insulated thoroughly with paper and shellac. In both experiments the amount of iron is the same in the coils, the mere separating of the plates of iron increases the induction, and bringing them together decreases it, and all this can be very nicely shown to a class or in a lecture room by the simple arrangement sketched. The lamp makes a splendid galvanoscope, showing the rise and fall of the induction in the coils.

I shall be glad to hear of any explanations anyone may offer.

A considerable number of volt and ammeters are made in which this repulsion of pieces of iron inside a coil carrying a current is made the measure of the current in the coil; in these instruments this effect may play some part worthy of note if the induction is greater when the iron is parted than when close together.

In the Hedgehog transformer the parting of the iron wires at the ends of the coils very greatly increases the induction through the coils. By this experiment it is found that parting the iron inside of the coils also increases the induction through them.

ROPE-POWER TRANSMISSION.*

BY JAMES M. DODGE.

(*Continued from page* 381.)

It is impossible to splice a rope without impairing its strength at the splice, provided its diameter is not increased. What is ordinarily known as the "short splice," or the "long splice," as used by sailors, will not answer at all. It is essential that a splice (for instance, in a rope one inch in diameter) should be from ten to twelve feet long, and made with great care, so that after the splice is complete the tension to which the rope is subjected is evenly divided among the strands of the rope.

Durability of manila rope transmissions is dependent upon various conditions, the most important one probably being the quality of the rope. In order to make good rope it is necessary that the fibres employed in its manufacture should be long and of nearly uniform size. The fact that the fibres of manila have a rough interior and are of great strength in proportion to their weight, is an important factor in the strength of the rope when subjected to a tensile strain, but at the same time this very roughness becomes an element of destruction when the ropes are passing around sheaves which cause the fibres to slide upon each other so that the internal wear of a rope becomes a most serious agent in destroying it. A worn-out rope untwisted so as to expose the strands, will show a fine powder which has been chafed off the fibres. Of course, after this has been detached from the fibres, it leaves them weaker than in their original condition. It is also noticeable that the fibres of manila, being composed of elongated cells, are not perfectly adapted to continued bending.

In order to counteract the destructive tendencies enumerated, it is essential that the rope should be lubricated. This is accomplished in two ways, the first being by the introduction of a lubricant in the manufacture of rope; notably, as in the case of what is known as the "Stevedore," into which tallow and graphite are introduced at the time the rope is made, the effect being to increase the flexibility of the rope, increase its life and to render it to a degree water-proof; and also in the ropes of some other makes, which are laid with tallow. The second method is to coat the outside of the rope with a mixture of lampblack or graphite and grease, relying upon the working of the strands of the rope with relation to each other to work the compound through it. This latter method is practised on the Continent, and is also being made use of in this country to a considerable extent.

Some of the larger constructors of the rope transmissions in England claim that manila rope should never be used under any circumstances; that cotton is the only fibre that will give satisfactory results. I have seen samples of a rope one and three-eighth inches in diameter, which had been in constant use ten hours a day for nearly sixteen years. This was a cotton rope, known as the "Lambeth," the peculiarity of its construction being that it was primarily made of cotton, but each of the four strands of the rope was covered with a number of tightly twisted yarns, forming a protecting envelope, which prevented cutting or wearing of any of the strands proper of the rope. Of course, cotton ropes are much more expensive than manila ones, and a rope such as the "Lambeth" must necessarily be the most expensive of those made of cotton.

It is unquestionably true, that in time cotton ropes will be more extensively used in this country, crowding out the use of manila; but it is a fact that the introduction of any radical departures in the field of mechani-

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*From *Electrical Review*, London, June 9.

cal engineering are only possible by offering not only a more satisfactory article than has formerly been used, but also a cheaper one. This fact has aided in the introduction of the manila rope drive, as in many cases it is not only the best means of transmitting power, but also the cheapest. Ultimately, and as users of rope drives become more familiar with their intrinsic advantages, they will be more ready to increase the original outlay and put in the best rope that can be made.

If manila rope transmissions are designed with good judgment and are properly erected, there is no possible doubt of their giving satisfactory results. The prevailing notion is, however, that as rope is flexible in all directions, rope drives can be constructed in a haphazard manner, without special care being exercised in getting the sheaves in exact alignment, and considerable criticism has been engendered by lack of attention to the important details. When borne in mind that a rope used for the transmission of power runs at a speed as high as 5,000 feet per minute in many cases, and as a rule the rope is run in close proximity to the ceiling, which is the hottest part of a room, it is not surprising that the rope rapidly becomes dry and correspondingly brittle; hence, the importance of lubricating it in some way, to counteract the drying tendency. It is not uncommon to find rope transmissions erected so that the sway of the rope will occasionally bring it in contact with a beam which, of course, results in extremely rapid wear of the outside of the rope. The fact that conditions of this kind exist is sometimes hard to discover, as when the rope is at rest it may apparently have abundant clearance throughout the path of its travel. One case brought to my attention, in which the rope was being rapidly worn out, resulted in the discovery of the fact that in its passage through the wall of a building, the rope would sway and come in contact with the edge of a corrugated iron covering of the building. On calling this condition of affairs to the attention of the parties operating the drive, they seemed quite surprised that such a trifling thing as an occasional touching of the rope on the corrugated iron should in any way impair the life and usefulness of the rope.

Manila rope is usually run under a working strain equal to three per cent. of its ultimate breaking strain and at velocities varying from 3,000 to 5,000 feet per minute.

To determine the power which any rope will transmit at a given speed, it is necessary to ascertain the nature and amount of the strains to which it is subjected while running, and then to find the exact part of the total working strain which is expended in performing useful work.

Generally speaking, ropes in the "American" system are subjected to three principal strains, viz: the strain due to the power transmitted; that due to centrifugal force; and that due to the tension carriage weight. Besides these three there are the minor strains, due to the weight of the rope, the internal resistance of the rope to bending, and the strains required to make the rope enter and leave the wedge-shaped grooves. With good ropes running in well-made grooves, the minor strains do not probably absorb more than five per cent. of the working strain of the rope.

As an illustration of the method of determining the horse-power of a rope in the "American" system, let us assume the case of a one-inch rope travelling at a speed of 4,500 feet per minute. The breaking strain of this rope as given by the Plymouth Cordage Company, is 9,000 pounds, and according to the limitation imposed by good practice, the total working strain should not exceed three per cent. of this, or 270 pounds. Deducting five per cent. for the minor strains, we have 257 pounds which represents the sum of three principal forces.

In order to obtain the effective strain, or driving force, it is first necessary to find the strain due to centrifugal force. This force varies directly as the square of the speed, and may be found by multiplying the square of the speed in feet per second by the weight of one foot of rope, and dividing the product by thirty-two.

Now, the weight of one-inch manila rope per foot is .33 pounds, and the centrifugal force, therefore equals

$$\frac{75^2 \times .33}{32} \text{ or about 56 pounds.}$$

Subtracting this from 257 pounds, we have 201 pounds as the sum of the strain due to the power transmitted and the strain due to the tension carriage weight.

Now a series of carefully conducted tests have established the fact that a weight of (say) fifty pounds on one end of a rope wrapped half way round a sheave having a 45° V-groove, will sustain, without slippage, about three and one-half times its weight at the other end of the rope. Assuming, for the sake of safety, that this ratio is as 1:3, it is evident, that to sustain a strain of 201 pounds on the tight side without slippage, it is necessary to maintain a tension of one-third this amount, or sixty-seven pounds, on the slack side. The effective strain, or driving force, will, therefore, be equal to the difference of these strains, or 134 pounds, which at 4,500 feet per minute will transmit.

$$\frac{4,500 \times 134}{33,000} \text{ or } 18.4 \text{ horse-power.}$$

In the same manner we find that at a speed of 1,800 feet per minute, the centrifugal force is only nine pounds and the effective strain is 166 pounds, transmitting nine horse-power; while at a speed of 6,600 feet per minute, the centrifugal force is 125 pounds and the driving force only eighty-eight pounds, transmitting 17.6 horse-power.

On reflection it is evident, that as the speeds are increased the centrifugal force increases, and the effective tension must be reduced to avoid overstraining the ropes. At a speed of about 4,800 feet per minute the ropes attain their greatest efficiency, *i. e.*, they will transmit more power with the assumed working strain than at any other speed, either higher or lower, although there is but little variation in the power transmitted at that speed and the power transmitted at either 4,200 feet per minute or 5,400 feet per minute, thus giving a wide range from which to choose. It is well to bear in mind, however, that the higher the speed the greater the wear of the rope, and that for this reason the slower speed is the more economical. All things considered, speeds of from 3,600 to 4,200 feet per minute are best.

It may be well to note, that for the working strain assumed, viz: Three per cent. of the ultimate breaking strain, forty diameters should be regarded as the minimum size of sheaves to be used. If it is necessary to use sheaves of smaller diameter, the working strain should be proportionately reduced; thus in the case previously considered, an inch rope at a speed of 4,500 feet per minute transmitted 18.4 horse-power; now if it is desired to use a 30-inch wheel as a driver, it is advisable to reduce the power transmitted to three-quarters of 18.4, or 13.8 horse-power. This rule does not only apply to the driving and driven wheels, but also to any intermediate idlers around which the rope may be called upon to bend.

The idlers of rope transmissions have usually been made with semi-circular grooves, permitting the ropes to rest upon the bottoms of them. It has been found better, however, in practice to use the V-shaped groove for all purposes, as it insures a revolution of the idlers at the same speed at which the rope is traveling, and thus prevents the wear due to the slipping of the rope in the grooves of the wheel. It has been shown, that idlers having semi-circular grooves in them become highly polished, while those having V-shaped grooves do not. Thus the demonstration that the ropes slip to a certain extent in passing over idlers with the semi-circular grooves is complete.

The use of the tension carriage in the "American" system of rope transmissions is two-fold. In the first place where a continuous rope is used, passing over the grooves of two sheaves, it is obvious that the rope must be wound spirally around the two wheels, and that unless the rope in passing off the last groove of one of the wheels is not conducted back again to the first groove of the wheel, the drive would become inoperative, from the fact that all of the wraps of the rope would soon run off and leave the wheels without connection between them. In order to make this return, the wheel of the tension carriage is set at an angle so as to enable it to make the proper return of the rope. Secondly, the tension carriage is weighted so as to give the proper tension to the rope and serve as a corrective agent to the trifling inequalities that may exist in the sheaves or in the rope. It is by the weighting of the tension carriage that we are enabled to tell the exact amount of strain to which we are subjecting a rope. I might add, that the tension carriage being mounted on guides, it is capable of maintaining the proper tension of the rope even if the latter becomes considerably elongated by the strain put upon it or is variable in its length, due to atmospheric changes. This latter is especially noticeable in rope transmissions which are used wholly, or in part, out of doors, they being subjected to the action of rainy and dry weather.

The use of wire rope for the transmission of power I will only briefly touch upon, by stating that the economic use of it seems to be confined to transmissions of great length between centres. The sheaves employed have to be of very large diameter; otherwise the rope becomes crystallized and is of short life.

With reference to raw hide I might say, that its cost has prevented its general adoption, as it is cheaper to use an increased number of strands of manila rope to accomplish the desired result, though it has one marked advantage, inasmuch as it is possible to use it on sheaves of smaller relative diameter than in cases where manila rope is employed.

If possible, in running the rope care should be taken to have the bends all in one direction; as a rope bent in opposite directions will wear with much greater rapidity.

RAPID TRANSIT IN NEW YORK CITY.

At last the members of the rapid transit commission have come to an agreement and there is reason to hope that rapid transit is not far off. The Manhattan Railroad Company is given the choice of paying 5 per cent. of the net earnings, or a minimum of $125,000 or $175,000 a year as the rental of the franchises The following resolutions were passed expressing the views of the commission:

Resolved, That section 10 of the resolutions of April 12, 1893, shall be amended so as to read as follows:

Resolved, That the said Manhattan Railroad Company shall, within two years after the completion of the branch line or extension to Fort George, construct and build a branch line with not less than two tracks from 162d street and 10th avenue, along the Kingsbridge road to Kingsbridge.

Resolved That whenever the branch lines from 108th street to Fort George, and from 162d street to Kingsbridge, as herein provided for, shall realize to the Manhattan Railroad Company, in the operation thereof, 4 per cent. for one year on the actual cost thereof, then the Manhattan Railroad Company shall extend the said last named branch along Broadway to the city limit, within not less than two years from the expiration of the year within which said 4 per cent. shall be earned.

Resolved, That the cost of construction to Fort George and Kingsbridge shall be ascertained and certified by the Controller of the city of New York at the time of construction.

Resolved, That the method of ascertaining the 4 per cent. net result in the operation of said branches shall be as follows:

That the gross ticket sales at all stations and upon said branch lines shall be regarded as the gross earnings of said branches.

That the percentage of operating expenses and taxes to gross earnings of the entire system for the same period shall be construed to be the percentage applicable to the operation of said branches.

That the net earnings thus ascertained shall be construed to be the net earnings of the said branches.

Resolved, That section 14 of the resolutions of April 12, 1893, be amended to read as follows:

Resolved, That as compensation on the new franchise hereby and heretofore approved, the Manhattan Railroad Company shall be required, upon the execution of the contract, to pay into the city treasury the amount of all sums disbursed for the account of this commission since its organization, and also from time to time to pay into the city treasury all sums that may at any future time be disbursed by this board in connection with this work in carrying to completion the proposed extensions and facilities to be given to the Manhattan Railroad Company.

If these large additions to the elevated road are to be made it would seem advisable to construct it, so as to be operated by electricity and with the idea of ultimately adopting the electric system on the whole road, thus doing away with the smoky and dirty engine.

Electric Cables in Paris—The Popp Company, of Paris, after having tried, with unsuccessful results, several methods of laying its electric cables under ground, now intends to try another, which, it is thought, will give better satisfaction. The cables will be incased in lead, armored, and laid directly in the ground in a layer of sand. They will consist of a core of copper wires, a double insulating envelope of vulcanized India-rubber, and ribbon coated with India-rubber, a leaden sheath .0025 of a meter in thickness, a layer of jute, a sheathing consisting of two steel bands, each 1.6 millimeter thick, and an envelope of jute with a special coating. Previous to joints and connections the insulation resistance of this system is to be 2,000 megohms per kilometer at 3,000 volts.

NOTES ON COST OF OPERATING CABLE RAILWAYS.*

By. D. Bontecou.

The demand in recent years for improved street railway service has developed an active interest in the cost and efficiency of cable roads, but the contributions to the general fund of knowledge by those who have built or operated them have not been in proportion to the importance of the subject.

There has been so much misinformation about the net results which can be expected from a cable railway, inspired by commercial interests, or by a vicious tendency to generalize without studying the special cases, that it seems proper to present a few facts, and to draw from them some inferences as to the real importance of what have been properly considered as serious objections to the cable system. It is, perhaps, generally understood that the cost of operation for a fast and frequent service is less with the cable than with any other form of traction; and that the cost of first rate construction is so large that a considerable volume of business is necessary to produce a return on the investment.

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*Paper read April 19 before the American Society of Civil Engineers.

It is not well understood where to draw the line which determines the amount of gross receipts which will justify constructing a cable road of a given cost, and some conclusions may be drawn from an exhibit of the actual facts as to first cost, and cost of operation in the case of a single system in Kansas City, which, as operated under the conditions of its last fiscal year, may be selected as representing the inferior limit of justifiable cable operation, its net earnings having been about 3½ per cent. on its cost; and the daily average of passengers transported having been but 1,706 per mile of double track. This system is well equipped and managed, has given a very satisfactory service, and affords an excellent illustration of what can be done with cable traction under adverse conditions of business.

The property comprises 8.54 miles of double track, disposed as a trunk line in the business part of the city, with three diverging feeders, the whole being operated as three distinct lines with one common terminus, and serving a territory of which about two-thirds is sparsely built up.

There are three ropes, 14,200, 29,500 and 31,000 feet long, respectively, driven from a power house at the junction of two of the lines, and a fourth rope, 18,900 feet long, driven from a separate power house at the outer end of the third line.

The speeds are as follows: 7.8, 9.85, 9.85 and 10.25 miles per hour.

The track includes 716 degrees of double track curvature, with no grades exceeding ten per cent. the conduit is 36 inches deep, and the rope 1¼ inches in diameter, carried on 12-inch pulleys.

The cars are of the combination type, seating forty persons, and running on two four-wheel trucks, with 22-inch wheels, and equipped with side bearing grips. The machinery plant of main house consists of one 36x48-inch and one 32x48-inch simple non-condensing engines, which are run alternately, three 200-horse power boilers, and an electric light plant. The driving drums are 12 and 14 feet in diameter, with solid grooves, and one drum of each pair is an idler.

The machinery plant in the branch power house consists of one 24x48-inch simple engine, with two 175-horse power water-tube boilers and driving machinery. The main engine house contains the offices and shop. The branch engine house includes car storage for the cars of its own line, and there are car houses at the ends of the other two lines.

The equipment comprises 99 combination cars.

The system has been in operation four years, so that its maintenance expense has reached a normal rate.

The construction account is as follows:

Real estate	$116,736.38
Underground obstructions	20,285.38
Substructure	542,819.65
Track and line machinery	276,074.99
Paving	159,091.83
Buildings	184,391.69
Machinery	130,003.37
Equipment	202,926.47
Ropes and splicing tools	30,759.65
Patents	12,950.75
Engineering, legal and miscellaneous	83,017.47
Discount and interest	146,931.31
Total	$1,905,989.11

The figures are exclusive of cost of franchise and grading new streets, and show an average cost per mile of $223,184.

The conditions and results of the operation of this line for the year ending April 1, 1892, are condensed in the following table, which is taken from the company's published reports, the details of motive-power expense being somewhat amplified.

As the cars weigh 11,000 pounds, seat forty people, and entail the same train-service expense as the more usual train of grip and trail car, each car-mile is equivalent to two standard car-miles, and the term car-mile should be understood in what follows to mean a standard car mile.

OPERATING EXPENSES.

Car service and expense			$73,314.87
Injuries to persons and property			5,086.57
Secret service			528.65
Repairs, cars			4,862.14
Car-house service and expense			9,620.34
Maintenance, track and building			8,429.07
Motive Power:			
Fuel	$17,407.00		
Water	1,157.10		
Oil and grease	1,040.61		
Engine-house service	7,786.11		
Repairs, machinery	268.21		
Engine-house expense	299.01		
		$27,958.04	
Ropes	$29,380.60		
Rope service and expense	3,065.69		
Repairs of grips	1,789.46		
		$34,235.75	
			62,193.79
Taxes			4,596.00
General and miscellaneous			26,610.30
Total			$195,241.73

The total car-mileage was ("combination" cars, 1,415,366)	2,830.732
The number of revenue passengers carried	5,318.410
The number of passengers per car-mile	1.9
The average number of (combination) cars run daily	61

This statement includes every item of expense, and shows a net result of 6.9 cents per car-mile, or 10.3 cents if the interest on cost at 5 per cent. be considered.

While there is no unit of operating expense which can be used as a basis of comparison between roads run under different conditions, the "car mile" most nearly serves the purpose. The item of motive power being directly effected, however, by the ratio of weight of passengers to weight of cars. It is probable that the cost of operating these lines might have been increased to a small extent, possibly one-half per cent. per car-mile, by a larger volume of business.

Recurring to the details of motive-power expense, the fuel and rope accounts are objects of special interest. The fuel used is bituminous Kansas coal, with about 18 per cent. ash used in the form of nut and slack coal, in proportions of 3 to 2, the cost being $2.01¼ per ton of 2,000 pounds. Allowing 30 horse-power, or a consumption of about 255 tons per annum, for electric light and shop engine, we find that the coal consumption, without deduction for getting up steam and banking fires was 5.93 pounds per car-mile, and about 2.1 pounds of coal per ton-mile. The great variation of engine loads makes it rather impracticable to determine the average power required; but by assuming the evaporation ratio as 7 to 1, as determined by tests made of one of the boilers, run under average conditions, and steam consumption of 28 pounds per hourly horse-power, and allowing about 5 per cent. of the fuel for banking fires and getting up steam, an average horse-power of 575 is indicated, as developed by the two engines, this result seeming very reasonable in the light of the indicator cards which have been taken.

A total indicated engine friction is 64 horse-power, and the total resistance of all ropes when no cars are on the line has been accurately determined at 345 horse-power, leaving 166 horse-power as the average increased resistance of rope due to loads, and the traction of 61 cars with their passengers, or 2.72 horse-power per standard car. The actual efficiency cannot well be determined in the absence of reliable data of power required by the cars, and of the increase in rope resistance due to loads. but the net result of $\frac{99}{100}$ cent per car-mile for all engine and fuel expense is sufficiently definite.

These figures by no means represent the results which may be obtained by cable traction under more favorable conditions, and a better showing can probably be made by a number of roads. One line in the East had a record last year of 2.28 pounds of coal per car mile, the average load being $4\frac{2}{3}$ passengers per car-mile.

The cost o ropes on the Kansas City road, with incidental service and grip repairs, is 1.21 cents per car-mile. These ropes last from six months, in the case of the short main line ropes, to two years in that of the independent branch line ropes, and have an approximate life, respectively, of 20,000, 55,000, 68,000 and 130,000 miles.

As the cables are bought on a guarantee and the cost charged out each month, this account is a perfectly definite one, and its relative amount—about one-sixth of the whole—does not justify the terrors with which the maintenance of the ropes has sometimes been invested.

The statement of first cost given above is of value in showing the distribution of the construction expenses in a substantially built road, and in a general way the cost of the items, which are peculiar to the cable system, and also as an approximate indication of the addition to the operating cost to be made on account of the interest charge. Nearly all these items would be modified by different conditions, but these lines could be built today for less money than they cost five years ago.

For further illustration, and for comparison with the cost of the Kansas City road, a summary is given below of the cost of a line in the East, built to serve a heavy traffic, and designed to secure results of permanence and small operating expense, which have been fully realized. It is almost straight in its alignment, very fully equipped, and the 33,000-foot rope is driven by compound-condensing engines of 300 horse-power.

COST OF CABLE ROAD 3.05 MILES LONG.

Real estate	$67,065.21
Underground obstructions	46,500.00
Substructure and track	222,386.38
Paving	83,000.00
Power house and vault	103,032 02
Machinery and plant	65.563.34
Equipment (88 cars)	85.949.98
Rope	10,394.34
Patents	8,000.00
Interest	22,136.05
Engineering, legal and miscellaneous	16,845.61
Total	$730,872.93

A total cost per mile of $239,240.

Census Bulletin No. 55 states that the cost of ten cable railroads, varying from $160 000 to $684,000 per mile and averaging $350,000 per mile.

These statistics, although bearing the Government imprint, are misleading in failing to show how they are derived, and certainly give no indication of the legitimate cost of cable railway construction under any usual circumstances, and irrespective of the value of municipal franchises, and cost of horse railway properties. It is true that the actual construction account will vary with the conditions of location and alignment, the extent of the equipment, and other causes, but the more usual range of cost should be between the limits of $150,000 and $250,000 per mile.

These figures are significant so far as they bear on the question of probable net earnings, and indicate an addition to the operating expense per car-mile of from $2\frac{1}{4}$ to $4\frac{1}{2}$ cents, under almost all conditions, with a service not materially less than 1,000 car-miles per mile of double track daily. It is true that there are cable roads which have cost somewhat more to build and a great deal more to operate than those the author has referred to, but to reach conclusions upon the system it is proper to consider only such as have been built without entanglement with construction companies, or incompetent engineering, and which have been run with a reasonable amount of skill and economy.

An analysis of the affairs of cable roads which have been skillfully designed to meet the conditions of city traffic, with a view to the results of a long investment, and which are being intelligently operated, will usually develop figures of cost for doing the work so low that the popular statements as to expense of cables and extravagant use of power cannot well be sustained.

It is to be regretted that the interests of the owners of street railways usually require that their affairs should not be made a matter of public information, as otherwise facts of great interest and value could be readily collated bearing on the details of their operations. There has been sufficient experience, however, to take the consideration of cable roads as business propositions out of the region of conjecture, and to enable the engineer to make a reasonably correct forecast of cost, traffic and operating expense.

PHILADELPHIA NOTES.

When our representative called on the electric industries of Philadelphia, June 20 and 21, business was going on as usual notwithstanding the high temperature of 100° F. Very few complaints were heard regarding the money market and slow payments of accounts. Everybody was as busy as bees.

James M. Price, 125 South 5th street, Philadelphia, have attained great success in joints for rails and railway work. They are very strong and durable. A variety of joints are being made and lettered up to K, to meet the requirements of all kinds of rails.

The Novelty Electric Company, 54 North 4th street, Philadelphia, Mr. C. T. Trump, manager, has received large orders for direct and alternate current fan motors, They are said to take very small amount of current. The company's general line of supplies is having their usual demand.

The Cutler Electrical and Manufacturing Company, Philadelphia, makers of the popular C-S Flush, single, double and three wire switches. The demand has greatly increased for these goods, since the principal architects of the country have discovered their usefulness, by Mr. Cutter, the inventor, calling on them with a sample outfit, showing the actual workings of the switches.

Partrick & Carter, 125 South Second street, Philadelphia, were established in 1867, and are one of the oldest houses in the country making household electrical supplies, in annunciators, burglar alarms, bells, call systems and batteries. They are noted for their telegraph supplies, including first-class sounders and relays for railway and commercial use, fine learner's instrument sets, etc.

A. F. Moore, Third and Race streets, Philadelphia, is without doubt the oldest house, in the country making insulated wires. Orders were booked here in 1833 for cotton covered copper wires for electrical purposes. The house does a large business. Send for catalogue and price lists.

Weston Bros., Ninth and Filbert streets, Philadelphia, are manufacturers of switches, switch-boards, theartre and special large rheostats and other heavy electric light specialties. They are having their usual good trade.

The Geo. W. Pearce Company, Philadelphia, has recently issued to the trade a special illustrated catalogue osolid bronze metal pushes, bell pulls and mouth pieces- It shows some very tastefully designed goods. The comf pany manufacture and carry in stock at its office and salesrooms, 510 Arch street, an extensive line of electrical supplies and hardware.

Walker & Kepler, Philadelphia, the big contractors, are very busy. The great demand for Diehl ceiling fans and motors is keeping a large force of their men busy. They have one of the largest salesrooms in the city, and carry a large variety of stock in motors, fixtures, etc.

The S. S. White Company, Philadelphia, Twelfth and Chestnut streets, has completed its long series of tests on its primary battery for power uses and is convinced that this form of cell may be used successfully for such uses. The company will soon issue circulars describing its business, to the trade.

The Helios Electric Company, Philadelphia, with the ever popular Dan Spruance at its head, is selling its new alternating current arc lamps as fast as they can be made. About 500 of the Helios arc lamps are in use in the World's Fair buildings and the Midway Plaisance.

Queen & Company, Philadelphia, the noted fine instrument makers, states that orders are still coming in briskly.

The La Roche Electric Works, 116 N. Sixth street, Philadelphia, are very busy in their present factory. If the demand for their apparatus continues, larger quarters will have to be provided. There is a great demand for the alternating and direct current generators and motors made at these works.

Thomas H. Dallett & Company, York and Sedgely avenues, Philadelphia, mechanical and electrical engineers, are makers of the Billberg electric motors, generators, electric drills, etc., and special electric motors for all kinds of work. The Billberg generators and motors are in use in the large American cracker bakery at New York city, where the generators light the works with several hundred lamps and the motors run machinery, being supplied with currents from the generators.

The Standard Electric Company, 2246 North Ninth street, Philadelphia, have turned its whole force of operatives on its new standard Cyclone Fan Motor, to meet the demands of buyers. The motors are beauties and should sell on sight. Mr. R. E. Defendorfer, the general manager states that the company took orders for all they can turn out for a short time, at the exhibition of the Cyclone Motors in Philadelphia. The motors are noiseless in action and reasonable in price.

W. T. H.

CATALOGUE.

We are in receipt of a neat copy of the catalogue of Otis Brothers & Company, New York city, the makers of the noted Otis pump. In the finely-illustrated book is shown and described their new Otis pump and electric motor. The Otis electric pump as illustrated, should meet with a large demand as they are neat, compact and efficient. Much data is given in relation to these valuable pumps and also general data.

The Electrical Age's Illustrated Record of Patents.

Issued June 20, 1893.

499,726. Production of Alloys by Electro-Deposition. Charles R. Fletcher, Boston, Mass. Filed Feb. 18, 1892.

499,748. Telephone-Exchange. Alfred E. McClaren, Joplin, Mo. Filed June 13, 1892.

499,769. Regulator for Electric Motors. George H. Whittingham, Baltimore, Md. Filed Mar. 24, 1892.

499,778. Car-Wheel. Henry E. Butts, Detroit, Mich., assignor of one-half to William H. Mercer, same place. Filed May 11, 1892.

499,780. Means for Storing and Supplying Electrical Energy by Natural Force. Frederick G. Corning, New York, N. Y. Filed Nov. 14, 1892.

499,785. Apparatus for Treating Diseases. Emory J. Godman, Baltimore, Md., assignor to the Vibrometer Company. same place. Filed June 13, 1892.

499,786. Apparatus for Treating Diseases. Emery J. Godman, Baltimore, Md., assignor to the Vibrometer Company, same place. Filed Nov. 29, 1892.

499,811. Telegraphy. Pierson J. Wicks, Brooklyn, assignor to The Western Union Telegraph Company, New York, N. Y. Filed Mar. 3, 1893.

499,848. Secondary Battery, Fred O. Norton, Oroville, Cal. Filed May 26, 1892.

499,852. Electric Converter. Gustav Pfannkuche, Exeter, N. H., and Alfred Pfannkuche, Cleveland, Ohio, assignors to the Brush Electric Company, Cleveland, Ohio. Filed May 13, 1887.

499,871. Trussed Trolley-Board for Electric Cars. Henry Cochran, Chester, Pa. Filed Jan. 16, 1893.

499,882. Fender for Railroad Cars. Ferdinand Groshans, Baltimore, Md. Filed Jan. 7, 1893.

499,908. Stand for Electric Lamps. Joseph Cathrein, Innspruck, Austria-Hungary. Filed Feb. 15, 1893. Patented in Belgium, Dec. 2, 1892, No. 102,472, and in Italy, Dec. 31, 1892, No. 33,109.

499.910. Safety Attachment for Street Cars. Louis E. DuBois, Toronto, Canada. Filed Sept. 19, 1892.

499,916. Mode of and Means for Renewing the Filaments of Electric Incandescent Lamps. Gustav A. Frei, Springfield, Mass. Filed Nov. 14, 1892.

499,921. Electric Stop Mechanism for Knitting-Machines. Frank Hammond, Paris, Canada. assignor of one-third to John Penman, same place. Filed Jan. 9, 1893.

499,930. Electric Cut-Out. Otto F. Persson, Lynn, assignor of one-half to Hjalmar C. Schelin, Boston, Mass. Filed May 1, 1893.

499,943. Trolley-Wire Hanger. Lorenz Spillman, Columbus, Ohio. Filed Jan. 21, 1893.

499,964. Electric-Bath Metal-Heating Apparatus and Process. George D. Burton, Boston, and Edwin E. Angell, Somerville, Mass., assignors to the Electrical Forging Company, of Maine. Filed Dec. 31, 1892,

500,022. Electric Road-Vehicle. John W. Moakler, Denver, Colo., assignor of one-half to Horace E. Henwood, Kansas City, Mo. Filed April 16, 1892.

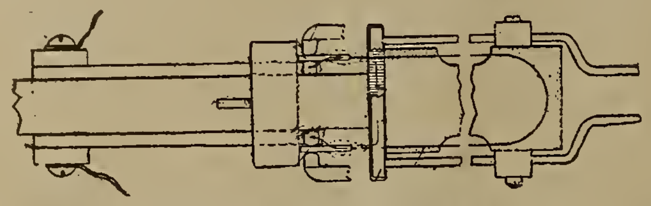
PATENTS.—Continued.

500,026. Electric-Lighting System. Charles L. Morey, Centralia, Ill. Filed Feb. 11, 1893.

500,027. Electric Bell. William J. Murdock, Boston, Mass. Filed March 18, 1893.

500,041. Electric Signal. George W. Swartz, Florence, Ala. Filed Oct. 31, 1892.

500,045. Automatic Electric Weighing-Scale. Charles F. Wood, Richmond, Va. Filed Aug. 30, 1892.



499,916—MODE OF AND MEANS FOR RENEWING THE FILAMENT OF ELECTRIC INCANDESCENT LAMPS.

500,053. Incandescent Electric Lamp. Edward E. Cary, Boston Mass. Filed Apr. 7, 1893.

500,065. Closed Conduit for Electric Railways. John C. Henry, New York, N. Y. Filed Sept. 8, 1890.

500,066. Electric Locomotive. John C. Henry, New York, N. Y. Filed Oct. 18, 1890.

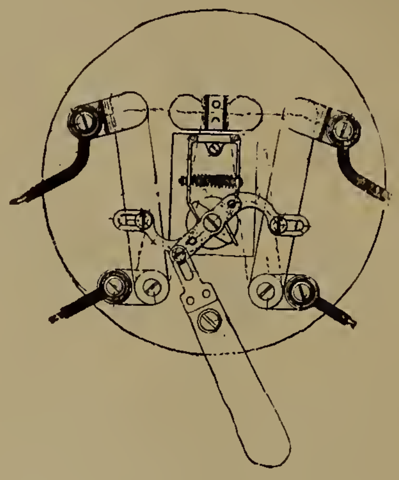
500,067. Electric Locomotive. John C. Henry, New York, N. Y. Filed Dec. 16, 1891.

500,068. Electric-Railway System. John C. Henry, New York, N. Y. Filed April 29, 1892.

500.070. Electric Railway Trolley. John C. Henry, Westfield, N. J. Original Application Filed Sept. 3, 1890. Divided and this application filed Feb. 1, 1893.

500,075. Incandescent Electric Lamp. William E. Nickerson, Cambridge, Mass. Filed April 1, 1893.

500,076. Incandescent Electric Lamp. William E. Nickerson, Cambridge, Mass. Filed April 3, 1893.



499,930—ELECTRIC CUT OUT.

500,077. Incandescent Electric Lamp. William E. Nickerson, Cambridge, and Edward E. Cary, Boston, Mass. Filed April 5, 1893.

500,078. Incandescent Electric Lamp. William E. Nickerson, Cambridge, Mass. Filed April 5, 1893.

500,079 Incandescent Electric Lamp. William E. Nickerson, Cambridge, Mass. Filed April 7, 1893.

500,104. Electric Railway System. Charles J. Reed, Orange, N. J., assignor of one-third to Gustav Stahl, Philadelphia, Pa. Filed June 27, 1892.

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No.	Description of Work, or Contract.	Party to whom proposals must be directed.	Time up to which the proposals must be handed in, 1893.			Further information and specification obtainable through ELECTRICAL AGE from	Amount, if any, to be deposited with bid in certified check.	Right to reject any bid received.	Special Remarks.
			Month	Day	Hour				
2*	Lighting the streets of the city with electric lights, for a term of five years, from July 1, 1894.	Common Council of the City.	Sept.	1	12 m.	Chairman of Committee.			
4	Construction and furnishing of an electric light plant, both arc and incandescent.	The president of the local Water and Electric Light Co., in the State of N. Y.							

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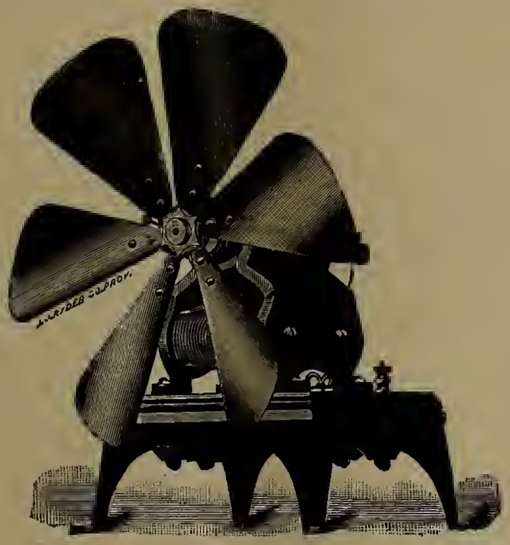

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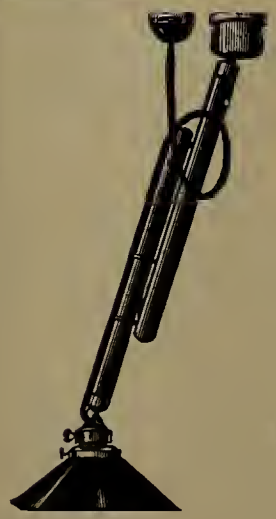

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As all advertisements under this heading will be consecutively numbered, reference to such number is required, where applications have to pass our hands.

Applications must be accompanied by postage for answer and forwarding.

23. WANTED—Armature winders. First-class men only. Reply by letter stating experience and giving references. Address, Electrical Age, Department C, 23.

31. WIREMEN—Two experienced electric-light wiremen. Address as hereabove requested.

41. WANTED—Armature winders; state experience and wages expected; also, machinists or carpenters; young men to learn electric business. Address as hereabove directed.

42. WANTED—Wiremen experienced on tube work. Address as hereabove directed.

43. ELECTRIC LIGHT WIREMEN WANTED—Experienced on tube work. Address as hereabove directed.

45. WANTED—Instrument or model-maker accustomed to brass work or light machinery; wages $12. Address as above requested.

46. WANTED—Polisher and buffer on brass work, cornice poles and rings. Address as above requested.

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56. WANTED—A good pattern maker. Address as above requested.

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60. ELECTRICAL and mathematical instrument makers wanted. Apply by letter as above requested.

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73. WANTED—Good wheelwright. Address as above requested.

74. WANTED—A man thoroughly posted as to the localities where mechanics of the mechanical and electric trades assemble, to introduce "Electrical Age" and "Street Railway News," containing free lists of vacancies, and to gather official notices. Liberal commission will be allowed.

75. WANTED—A1 assistant silver-plater on novelty work, good pay, steady job. Address as hereabove directed.

76. WANTED—Experienced electric wiremen in the city of New York. Address as hereabove directed.

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Advertisers' instructions as to disclosing their address will be scrupulously adhered to.

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8. POSITION WANTED—An expert in electrical instruments and other apparatus, wants position as superintendent or foreman. Desirous of changing position; has had 15 years' experience. Can furnish first-class references. Address as hereabove requested.

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12. POSITION WANTED—By a first-class mechanical and electrical engineer as foreman or superintendent, expert on motors and arc lamps. Address as hereabove directed.

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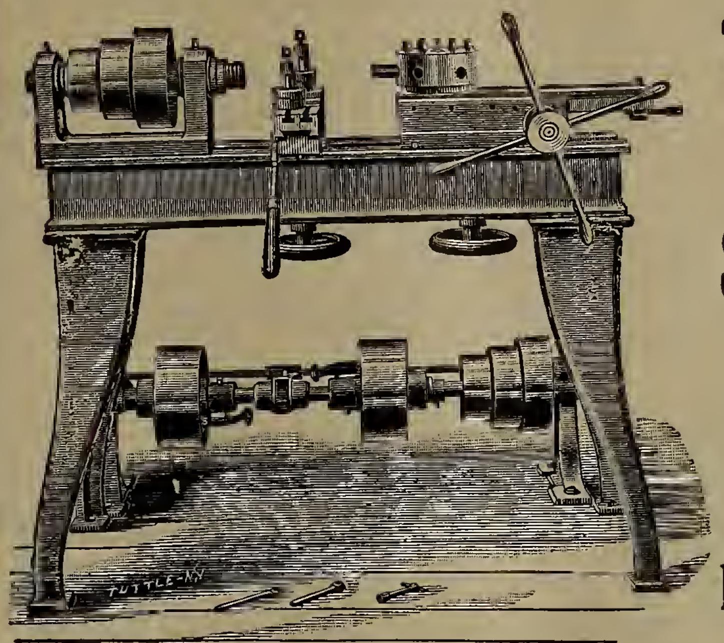

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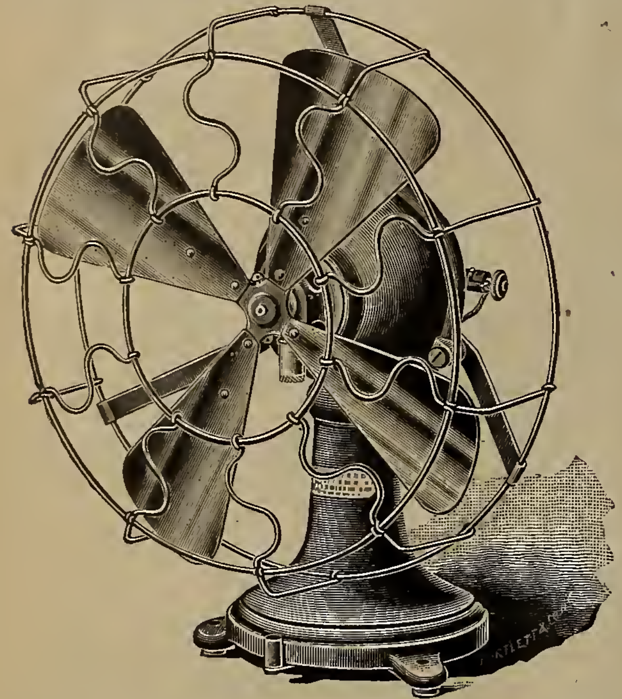

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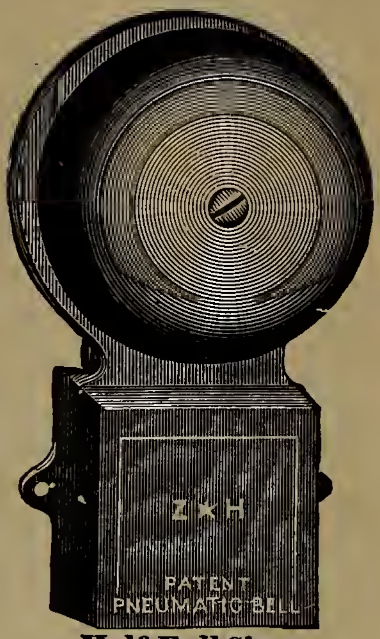

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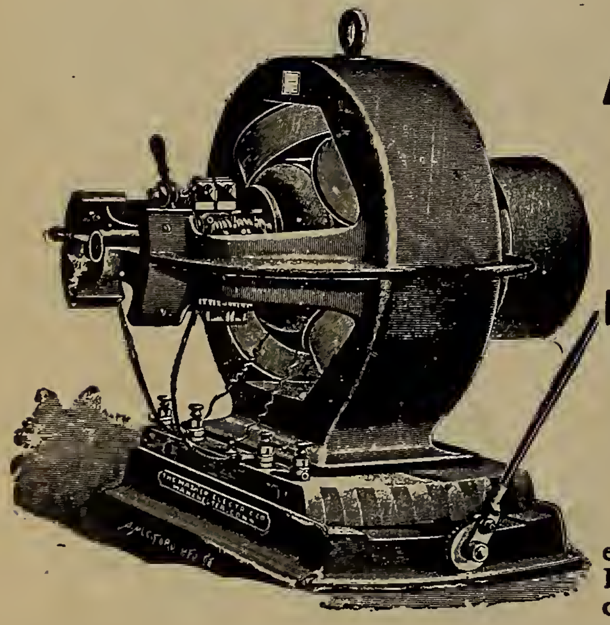

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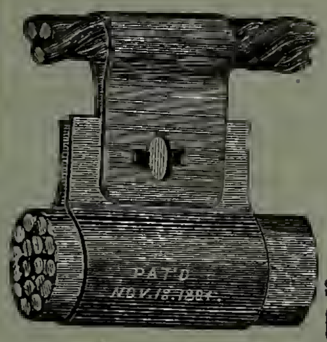

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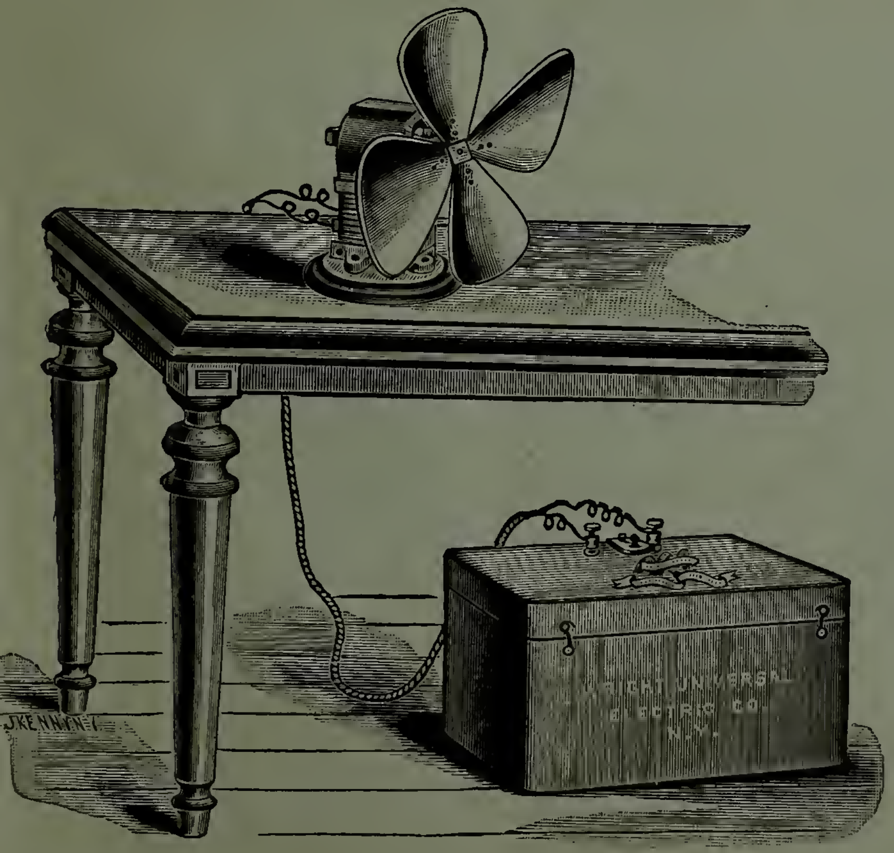
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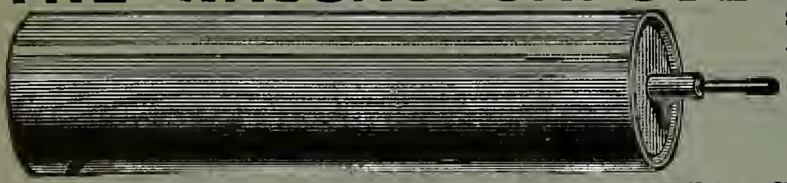
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